DEPARTMENT OF AGRICULTURE

BRITISH EAST AFRICA.

IMPERIAL BUREAU
27 JUN. 1921
OF MYCOLOGY

ANNUAL REPORT,

1914-1915.

PRINTED AT
THE SWIFT PRESS, HARDINGE STREET,
NAIROBI, B. E. A.

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CONTENTS.

1.	Report of the Director of Agriculture		1
2.	„ „	Chief of the Economic Plants Division ...	12
	„ „	Foreman Plant Instructor, Kibos ...	25
3.	„ „	Entomologist	38
	„ „	Plant Import Inspector	55
4.	„ „	Manager, Naivasha Stock Farm	60
5.	„ „	Manager, Kabete Experimental Farm ...	66
	„ „	Agricultural Instructor	80
	„ „	Foreman Plant Instructor	84
6.	„ „	Advisor for Tobacco	88
7.	„ „	Mycologist	94
8.	„ „	Coffee Plant Inspector	108
9.	„ „	Tropical Agricultural Instructor, ...	111
10.	„ „	Chief Veterinary Officer	115
11.	„ „	Veterinary Pathologist	125

ANNUAL REPORT

OF THE

AGRICULTURAL DEPARTMENT.

FOR THE YEAR, 1914-15.

DEPARTMENT OF AGRICULTURE,
NAIROBI, BRITISH EAST AFRICA,
OCTOBER, 1915.

HIS EXCELLENCY THE GOVERNOR,
Nairobi.

YOUR EXCELLENCY,

I have the honour to submit herewith my report of the Agricultural Department for the year ending 31st March 1915, together with the reports of the Chiefs of the various Divisions of the Department.

GENERAL.

In my annual report for the year 1913-1914 I summarized the advancement of the Industries of Agriculture and Stock Breeding in the East Africa Protectorate over a period of seven years. I am glad to say that the year under review was one of steadily increased prosperity.

The available statistics for the year do not bear out this statement, but it must be remembered that the abnormal conditions resultant on the outbreak of the war in August 1914 rendered such statistics unrepresentative of the real progress of the Country.

The Continental markets became, in many instances, closed to would be exporters, whilst increased freights and insurance to cover war risks on exportable commodities seriously handicapped the export trade.

On the other hand the large increase in the population for military reasons created a large local demand for most of the food stuffs.

STOCK.

Stock breeding and the grading up of native cattle and sheep have been pursued with continued success in the recognised stock districts of the Protectorate.

The policy of importing Government stock of good quality and disposing the progeny by auction sale to local breeders who would otherwise experience considerable difficulty in obtaining high class animals has again been greatly appreciated, as is shown by the continued support given by local stock breeders to the Annual Government Sale at Naivasha. This sale was held in March 1915, a large number of those interested attended, bidding was brisk, and good prices were realized.

The Department has recently imported from South Africa, twenty Friesland heifers, eight Friesland bulls, and fourteen head of Shorthorns. The introduction of fresh blood of these two breeds, which have been proved admirably suited to local conditions at Naivasha, should have most satisfactory results.

The ravages of East Coast Fever, among the stock of the country, have not been so great as in former years. The systematic dipping now practised on many farms accounting for the improvement.

During the year there were twelve outbreaks of Rinderpest on European Farms. However, a large head of stock has been doubly inoculated and great hopes are entertained that the disease will be held in check in the future.

Anthrax, an epizootic of this dread pest broke out in the Nairobi and Thika districts.

Another Catalonian Jackass has also been purchased to cross with the excellent progeny of the former imported Jackass and native donkey mares.

At the commencement of the war, when many horses and mules were brought into Nairobi for inspection it was found that Ulcerative and Epizootic Lymphangitis was much more prevalent than had been previously supposed.

Swine husbandry has received marked attention during the period under review. The demand on the Kabete Experimental Farm for young stock for breeding purposes has been unprecedentedly large and greatly exceeded the possible supply.

Swine fever from all reports has not caused so much havoc as in previous seasons. Careful fencing has probably caused this decrease.

CROPS.

Coffee. This remains the principal economic crop of the Highlands of British East Africa.

The area under Coffee cultivation has increased by leaps and bounds, and probably has been doubled during the past season.

The berry produced is of exceptional quality, and East African Coffee, now being familiar to English Brokers, readily commands high prices on the London Market.

It is a pleasure to be in the position to state that the leaf disease, Hemeleia vastatrix, has not proved the serious matter at one time feared, the experience of the last year showing, that, if proper means of control are used, the pest can be kept within moderate bounds.

A Coffee Curing Factory has been erected in the neighbourhood of Nairobi and should prove a boon to planters.

Fibres. The cultivation of Sisal and Flax has increased very largely during the year. The former is now a "proved" industry while the latter is rapidly becoming so. Recent reports from the home brokers and flax experts declare the flax sent from this country to be of excellent quality.

In the Lumbwa, Londiani, Nakuru and Uasin Gishu districts flax growing is likely to become an important branch of farming.

A factory for handling the fibre has been built at Lumbwa, and others would have been erected had not the present disturbed state of affairs occurred.

Maize, Beans, Potatoes and Sim Sim. The successful cultivation of these crops continues throughout the farming areas of the Protectorate. There is a sound local market for all these products, and in normal times the export value warrants the cultivation of large areas.

Cotton. The drop in the price of cotton, local buyers are in a position to offer, has seriously affected cotton planting by natives in the Nyanza Province where the cotton industry promised so well. It is greatly to be hoped that future prices will induce a revival of the industry.

Wattle.—During the past year arrangements were made by the wattle growers of the Highlands to form a Syndicate to erect a factory for the extraction of tannin from the bark, but, owing to the war no further progress has been made in the matter.

In this connection it may be mentioned that those interested in this industry in South Africa have recently made many experiments in extracting the tannin from the green bark.

The Director of the Imperial Institute, London, has forwarded the information that firms in England are also carrying out experiments in the extraction of tannin

It would therefore appear that we may shortly expect definite information regarding a suitable process to be adopted in this Protectorate.

Professor Dunstan also remarks in course of his communication, the following:—

> "There is a large demand for tanning materials in the "United Kingdom, and there can be little doubt "that a ready market could be found for all the "wattle bark extract of satisfactory quality that can "be produced in the East Africa Protetorate as "well as in Natal."

Coconuts.—Coconut planting in the Coast Belt is progressing. Every effort is being made to encourage the natives to improve their methods of cultivation, also to impress on them the necessity of destroying the beetle, Oryctes Monoceros, which does so much damage to the trees. My department has also conducted a campaign against this pest, traps were placed and regularly inspected. The resulting destruction of the beetles being very satisfactory.

The native practice of tapping their coconut trees for tembo which proves so injurious to the trees is strongly discouraged.

Legislation for the protection of the industry has been framed as a result of the report of the Coconut Commission 1914 and will, I trust, shortly become law.

Rubber.—The Rubber Industry may be said to be dormant. This unsatisfactory state of affairs may be directly attributed to the low price offered for Ceara rubber and indirectly to the brighter prospects in the Coast districts of such crops as sisal and coconuts.

Tobacco.—This crop is still in the experimental stage. But there are indications that in certain districts the crop will be a success.

Fruit Culture. Many planters are turning their attention to the cutivation of citrus trees. Limes and Lemons are the trees chiefly planted with the subsequent object of the local manufacture of the concentrated juice and citrate of lime for export.

The desire for budded or grafted stock has been so great that the nursery at Kabete Experimental Farm was unable to cope with the demand. Steps have, however, now been taken to largely increase the supply of these stocks in the near future.

This is one of the most promising industries in its infancy that has been started in the Protectorate.

Staff.—The following members of the staff proceeded on leave during the year :—

		Date of Departure		Date of Return.
Mr.	C. J. Monson	... 14th May 1914	...	2nd Jan. 1915.
,,	H. Powell	... 20th May 1914	...	2nd Jan. 1915.
,,	C.B. Armstrong	... 12th July 1914	...	9th Nov. 1914.
,,	L. D. Carpenter	... 23rd Oct. 1914	...	16th July 1915.
,,	R. H. Deakin	... 5th Jan. 1915	...	.....
,,	A. C. Mac Donald,	4th March 1915	...	22nd June 1915.

Mr. R. H. Deakin, Assistant Entomologist resigned when on leave.

Meteorological.—During the years 1914 and 1915, 71 new rainfall stations were established making a sum total of 163 rainfall and meteorological stations supplying records of observations to the Department of Agriculture.

The observations received are as satisfactory as can be expected under the present circumstances of control. A discontinuance of records from a number of Stations was marked at the commencement of the War in August 1914.

With the ultimate object of establishing a complete Normal Climatological Station (Second order Station of the International Classification) at Nairobi the amount of money placed at my disposal for instruments in 1915 has been expended, as far as possible, in the purchase of instruments towards this equipment.

This object has now been attained with the exception of a Mercury Barometer, (millibar and inch reading) which, owing to the tax on instrument makers, caused by the war, was unobtainable except on long standing order.

Rainfall records for 1914-15 are appended.

(Signed) A. C. MACDONALD,

Director of Agriculture.

RAINFALL RECORDS 1914.

Reg. No.	Station.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL.
2	Athi River Kenani Fibre Lands (Manager).	4·07	0·00	8·54	6·54	3·04	1·00	0·12	0·03	0·40	1·18	6·31	0·65	31·68
3	Athi River Station (U. R.)	0·37	0·82	3·15	1·20	4·03	0·68	7·61	4·44		No	Obse	rver.	
5	Baringo (D. C.)	4·94	3·50	6·90	6·60	11·67	7·86	4·77	5·43	5·36	7·77	12·05	5·10	81·95
4	Butare, Marama, (A. J. Leech) ...	...	0·00	2·35	8·88	10·79	0·00	1·88	2·41	0·47	1·43	7·61	0·75	36·57
6	Chania, Muthuri, (Cunninghame)	6·72	0·47	4·39	10·49	5·74	0·20	1·39	1·61	0·51	1·50	8·35	0·45	41·82
7	Chania Bridge (Henderson) ...	...	...	...	9·41	5·09	0·00	0·41	1·90	0·12	2·24	9·07	1·44	...
128	Chania Bridge (Oulton) ...	5·19	0·15	3·75	14·22	5·65	0·83	1·45	1·91	1·76	6·08	18·71	1·39	61·09
8	Chuka (D. C.)	3·93	0·44	6·35	8·52	9·66	0·17	0·48	1·24	0·58	1·39	3·18	0·30	36·24
9	Dagoretti Forest Station (Forester)	1·33	2·53	10·41	1·62	10·22	1·05	8·58	6·99	2·85	1·20	4·85	0·12	51·75
11	Eldama Ravine (D. C.) ...	1·57	1·19	4·51	3·61	4·11	0·46	7·18	3·27	2·44	0·74	3·76	0·69	33·53
12	Elmenteita (Chamberlain) ...	1·62	0·00	3·73	12·45	7·36	2·87	1·33	2·14	1·25	1·23	11·84	0·00	45·82
13	Embu (D. C.)	...	...	...	..	...	0·74	0·99	2·27	1·19	1·71	4·60	0·56	...
10	Escarpment Forest Station (Forester)	4·46	0·13	4·30	8·36	11·15	0·57	1·66	0·42	0·65	1·70	13·72	1·64	48·76
15	Fort Hall (D. C.)	6·51	4·37	5·60	5·47	8·56	3·48	5·79	7·28	0·95	3·73	4·20	0·53	55·47
17	Fort Ternan (Ross Bros.) ...	1.42	1·08	8.62	3·65	6·80	5·44	0·24	10·02	2·19	1·04	5·04	N.O.	...
20	Gendia (Kongo Bay) (Missioner)	1·18	1·15	3·58	3·01	1·01	2·90	3·88		No	Obse	rver.		
21	Gilgil Colulles Farm (Anderton)	...	...	...	1·24	4·27	2·76	1·88	2·22	1·13	5.42	5·12	2·03	...
22	Giryama (A. D. C.)	0·15	0·00	0·00	4·67	5·10	3·72	1·00	1·45	0·90	1·70	2·55	0·00	21·24
1	Gosha, Alexandra, (D. C.) ...	3·54	3·90	3·10	1·17	8·47	9·50	3·65		No	Obse	rver.		
23	Homa Bay (Customs Master) ...	4·02	0·36	9·09	10·00	7·18	0·47	0·81	2·91	0·20	2·38	6·80	1·05	45·27
27	Kabete Farm, Kikuyu, (Manager)	3·01	0·96	7·21	9·72	11·98	6·62	6·87	14·40	7·90	4·76	9·70	1·99	85·12
25	Kaimosi Mission													

28	Kakamega (R. C. Mission) ...	...	4·46	1·41	5·92	5·00	4·23	7·44	5·53	8·33	6·05	5·99	7·37	1·47	63·20
30	Kamiti Downs, Kiambu, (Relly)	...	4·17	0·49	5·02	13·50	4·00	0·23	1·41	1·77	1·55	1·02	7·54	0·44	40·84
31	Karura Forest Station (Forester)	...	4·58	0·33	5·02	14·10	6·39	0·07	0·77	1·25	0·24	0·64	3·34	0·68	37·41
32	Karungu (Customs Master) ...	...	0·41	0·00	2·70	1·19	2·75	1·58	0·32		No	Obse	rver.		
35	Kericho (D. C.)	...	1·85	1·98	6·21	6·18	11·37	6·37	6·30	11·01	8·01	4·80	8·64	2·19	74·91
34	Kericho (Lumbwa Industrial Mission)	...	4·70	4·54	4·66	8·23	14·31	4·54	9·60	11·43	5·90	5·53	10·05	1·09	84·58
33	Kericho (Orchardson Bros.) ...	...	4·19	4·51	6·01	9·76	13·13	5·21	9·98	9·17	5·70	5·62	8·40	1·60	83·28
24	Kiambu (Price Williams) ...	...	5·11	0·18	9·04	8·74	5·91	0·53	1·20	2·73	0·85	5·73	8·17	0·67	48·86
36	Kiambu (D. C.)	...	5·36	0·15	7·27	9·09	5·38	0·36	1·06	2·26	0·78	2·01	10·11	0·81	44·64
37	Kiambu Karamaini (Harries) ...	...	5·22	1·32	2·98	10·92	4·35	0·00	1·92	1·23	0·41	1·36	6·24	0·00	35·95
38	Kiambu Ruika (Fletcher) ...	...	2·64	0·45	4·24	8·41	3·80	0·30	0·00	0·73	0·38	0·98	7·25	0·33	30·41
42	Kibwezi (Anglo East Africa Rubber Co.)	...	7·24	0·54	1·47	3·15	1·23	0·00	0·05	0·08	0·00	No	Obse	rver.	
45	Kibos (Government Farm) ...	...	2·83	0·45	4·78	1·83	4·09	2·50	3·26	4·66	6·40	0·97	6·91	2·46	41·14
46	Kikuyu (C. of S. Mission) ...	...	2·71	0·00	7·67	7·91	10·20	0·20	0·71	1·67	0·30	2·32	4·24	0·15	38·08
39	Kinangop Forest Station (Forester)	...	2·35	1·88	11·00	2·76	7·52	1·23	N.O.	3·50	4·37	0·92	5·58	1·09	...
43	Kipini (D. C.)	...	6·56	0·00	0·30	1·20	14·55	8·13	1·59	1·58	0·40	4·35	1·69	1·75	42·10
44	Kisii (D. C.)	...	2·65	3·48	5·70	5·39	8·19	7·07	4·68	6·96	9·73	4·36	13·11	3·58	74·90
47	Kisumu (P. C.)	...	3·96	3·17	5·05	2·79	3·75	3·60	2·98	7·09	6·15	1·72	5·53	3·07	48·86
40	Kismayu (D. C.)	...	0·60	0·00	0·00	0·21	5·24	4·92	0·96	1·67	1·10	0·06	0·48	0·00	14·64
49	Kitui (D. C.)	...	6·68	1·50	2·16	6·68	3·46	0·14	0·00	0·81	0·00	0·84	15·85	1·17	39·29
50	Kiu Station (U. R.) ...	...	2·90	0·00	2·30	3·37	1·16	0·00	0·14	0·64	0·00	0·80	1·59	1·53	14·43
52	Lamu (P. C.)	...	0·00	0·00	0·00	0·34	14·66	7·72	0·78	1·73	0·75	9·85	0·45	0·01	36·29
51	Lari Forest Station (Forester) ...	...	5·28	0·25	8·64	7·64	16·94	0·62	0·93	3·12	1·85	1·12	8·45	0·00	54·84
53	Limoru (Caineville) (Caine) ...	...	4·39	0·00	6·27	5·40	11·55	1·16	1·32	3·91	1·56	3·00	7·40	0·18	46·14
54	Limoru (Cloverdale) (Conybeare)	...	4·41	0·47	6·06	5·58	10·44	0·85	1·05	3·47	0·51	3·09	6·76	0·17	42·86
55	Limoru Hope Farm (Impey) ...	...	4·67	0·06	8·06	7·25	8·56	0·91	1·00	3·37	1·16	5·04	8·48	0·86	49·42
56	Londiani Forest Station (Forester)	...	2·25	2·69	3·73	3·85	7·07	2·12	5·36	8·21	3·67	1·07	3·59	0·07	43·68

RAINFALL RECORDS 1914—(*Continued*).

Reg. No.	Station.	Jan.	Feb.	Mar.	Apr.	May.	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL.
62	Londiani Farm 1521 (Drought) ...	3·97	2·12	3·94	2·04	6·75	2·70	5·86	8·31	4·00	1·85	4·00	0·04	45·58
151	Londiani Kedowa (Isaacson & Miles) ...	N. R.	2·04	N. R.	3·70	10·33	4·74	7·16		No	Obse	rver.		
58	Londiani Tinderet Estates (Manager) ...	4·34	3·27	5·39	6·83	14·11	7·66	4·48	8·81	5·19	6·26	4·77	1·67	72·78
60	Lumba (Industrial Mission)	4·94	1·29	4·99	6·91	10·64	4·34	7·37	8·49	3·57	4·58	3·16	0·93	61·21
59	Lumbwa Station (U. R.)	2·45	0·40	4·40	4·15	10·17	2·55	8·47	8·34	3·19	1·47	3·20	0·52	49·31
61	Lumbwa (Wilson)	7·63	3·56					No	Obse	rver.				
64	Machakos (D. C.)	3·41	1·03	4·02	6·93	4 36	0·32	0·23	0·93	0·00	1·37	10·28	1·99	34·87
65	Mackinnon Road Station (U. R.) ...	2·60	0·50	4·20	2·80	2·30	0·80	0·50	1·70	0·37	3·21	3·21	4·19	26·38
66	Makindu Station (U. R.)	6·66	0·00	0·00	2·20	0·85	0·00	0·00	0·00	0·00	0·42	3·63	4·27	18·03
67	Malindi (D. C.)	0·01	0·01	0·66	2·07	15·66	3·49	2·53	1·58	0·58	5·16	3·65	0·00	35·40
68	Mara River (O/C Masai Reserve) ...	3·67	1·91	8·72	2·02	5·52	0·27	1·05	2·33	0·78	0·00	2·99	0·13	29·39
70	Maseno (E. A. Industries)	3·33	4·34	10·36	7·58	10·25	4·25	2·15	5·35	9·08	5·62	9·06	2·65	74·02
71	Masongelani Station (U. R.)	6·54	0·00	0·50	2·49	0·37	0·00	0·00	0·00	0·00	0·40	2·66	6·30	19·26
72	Mazeras Station (U. R.)	1·10	0·40	0·90	2·45	6·10	1·35	1·60	N.O.	1·29	7·55	5·05	3·35	...
90	Meru (D. C.)	5·32	0·00	3·57	11·19	10·39	0·00	0·55	1·60	1·43	6·66	24·12	1·98	66·81
77	Molo Overhaddon (Abrahams Bros.) ...	3·09	1·87	4·66	3·82	5·62	4·98	9·91	10·65	3·90	3·15	2·29	1·35	55·29
78	Molo Station (U. R.)	3·89	1·43	5·27	5·07	6·42	3·43	10·05	9·90	4·12	1·42	5·49	0·27	56·76
73	Mombasa Mto Panga Estates (Manager) ...	2·40	0·00	1·89	4·32	11·23	2·69	4·63	2·91	3·64	3·97	2·74	2·03	42·45
74	Mombasa M'twapa Estates (Manager) ...	2·45	0·00	0·73	5·75	12·68	2·70	0·82	1·62	1·70	1·97	3·04	0·50	33·96
75	Mambasa Nyali Sisal Estates (Manager) ...	2·35	0·00	1·50	4·31	9·76	3·32	2·47	3·18	2·13	3·72	1·84	1·08	35·66
76	Mombasa (P. C.)	1·71	0·17	1·34	5·12	8·15	2·32	2·40	3·37	1·35	4·21	1·60	1·53	33·27
80	Mua Hills, Machakos, (Milne)	2·58	0·00	4·05	7·33	2·49	0·27	1·14	1·48	0·00	0·81	9·64	1·09	30·88

81	Mumias (D. C.)	...	4·45	4·52	5·34	7·16	9·64	9·08	3·77	9·16	6·26	5·63	13·43	1·45	79·89
83	Muhoroni Station (U. R.) ...	...	N. O.	N. O.	1·15	5·32	11·85	6·65	8·36	8·90	2·50	7·96	17·40	3·20	...
86	Muhoroni (Webb)	...	3·21	3·65	10·12	8·87	8·04	4·22	6·75	6·37	...	11·18	...	0·89	63·30
82	Muhoroni (Capt. Charrington) ...	...	4·64	7·61	9·88	6·87	9·94	5·13	4·93	4·55	2·34	3·73	5·32	1·45	66·39
87	Muhoroni (Nyando River Rubber Co.)	...	2·73												
89	Muhoroni (Ireland) ...	...	4·83	3·65	5·76	4·58	9·27	3·82	6·11			No	Obse	rver.	
92	Nairobi Station (U. R.) ...	...	5·00	0·07	4·53	12·01	9·82	0·31	0·72	1·57	0·52	1·24	4·63	0·37	40·81
93	Nairobi Hill (Wood) ...	...	4·39	0·00	5·41	12·69	9·77	0·30	0·88	1·49	0·20	1·35	5·15	0·55	42·18
94	Nairobi (P. W. D.)	...	4·70	0·08	5·15	10·25	7·90	0·27	0·58	1·61	0·65	0·82	5·02	0·35	37·38
91	Nairobi Agricultural Dept., (Carpenter)	...	2·75	1·57	5·01	9·55	6·93	0·04	0·73	1·54	0·27	0·89	4·28	0·62	34·18
95	Naivasha Station (U. R.) ...	...	0·55	0·36	2·93	2·69	4·77	0·10	3·36	0·50	1·10	1·65	3·50	0·10	21·61
96	Naivasha (P. W. D.) ...	...	0·31	0·76	3·25	1·50	4·02	0·27	2·23	1·57	1·98	1·85	2·73	0·19	20·66
97	Naivasha M'Berrish (Marten) ...	...	0·69	1·83	4·24	1·37	2·91	1·38	1·20	2·16	2·31	0·59	1·11	0·00	19·79
98	Naivasha Rustenburg (Barry) ...	...	0·91	0·41	3·82	3·26	3·26	0·58	2·68	0·87	0·47	0·30	2·29	0·19	19·04
99	Nakuru (D. C.)	...	0·34	1·69	2·48	2·54	9·53	3·04	12·08	2·59	2·72	1·21	2·05	0·00	40·27
100	Nakuru Station (U. R.) ...	...	0·39	1·69	2·84	1·97	6·97	2·13	10·36	2·88	2·81	2·51	3·61	0·00	38·16
117	Nakuru Rongai River (Armstrong)	...	0·87	1·01	5·25	3·17	4·75	1·54	6·98	5·71	3·82	2·77	4·30	0·11	40·28
102	Nandi (D. C.)	...	4·25	2·00	6·30	5·39	13·79	6·43	6·17	10·87	8·97	7·44	5·27	0·30	72·18
103	Nandi (Abrahams Bros.) ...	...	3·67	3·67	8·75	4·93	10·60	4·01	4·94	4·61	...	14·39	...	2·00	62·57
107	N'gobotok (D. C.)	...	0·10	4·78	2·30	3·01	10·52	1·56	5·20	2·79	2·06	2·35	2·62	0·10	37·39
108	N'gongo Bagas (D. C.) ...	...	3·25	0·84	8·77	5·29	3·25	0·19	0·42	0·44	0·85	2·00	3·12	0·15	28·57
109	N'gong (Swedo African Coffee Co.)	...	5·01	0·09	7·67	8·16	10·98	0·34	0·63	0·32	1·12	1·80	4·60	0·68	41·40
104	N'Jabini Naivasha (Capt. Fey) ...	...	3·08	1·34	4·81	5·31	10·11	0·95	1·77	5·70	2·32	1·41	8·76	0·40	45·96
110	Njoro Thurland (Tunstall) ...	...	1·74	2·49	3·49	1·73	5·86	1·37	5·71	3·39	0·37	No	Obse	rver.	
111	Njoro (Faucus)	...	1·36	1·55	2·44	2·00	7·47	1·14	6·57	4·71	2·50	1·84	2·60	0·09	34·27
105	Nyeri (D. C.)	...	2·45	0·25	2·58	5·10	5·65	0·20	1·61	2·29	1·46	1·34	3·15	0·80	26·88
106	Nyeri Tumu Tumu (Dr. Phelps)	...	0·56	N. O.	3·23	9·01	7·96	1·41	1·38	2·28	1·70	4·14	6·83	0·32	...

RAINFALL RECORDS 1914—*(Continued).*

Reg. No.	Station.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	TOTAL.
114	Port Florence Station (U. R.)	4·19	3·46	6·15	2·90	4·14	3·43	2·59	7·47	6·43	1·76	6·24	3·41	52·17
116	Rabai (D. C.)	2·45	0·75	2·97	4·95	5·30	1·68	1·58	3·76	1·93	7·58	5·81	2·21	40·97
115	Ruiru Power Station (Nairobi E. L & P Co.)	...	...	New	Stn.	...	...	...	...	...	0·86	7·61	0·35	...
119	Shimoni (D. C.)	1·99	0·47	1·20	9·23	1·99	3·53	8·40	3·47		No	Obse	rver.	
122	Solai Bahati (Dawson)	...	...	New	Stn.	...	...	6·48	4·35	5·02	2·85	5·56	0·22	...
118	Songhor (Hutchins)	8·69	4·78	6·93	5·78	15·14	6·55	12·22	7·97	3·28	4·03	11·06	1·29	87·72
120	Sotik Nyangoris Park (Morgan) ...	7·73	3·19	8·31	6·57	5·75	1·77	2·30	2·10	3·10	1·61	7·38	1·82	51·63
121	Sotik (Hazlehurst and Tannahill) ...	7·06	2·61	5·48	6·43	5·36	2·22	3·21	...	14·34	...	...	2·33	49·04
123	Takaungu (D. C.)	0·95	0·00	1·43	1·46	7·78	5·12	2·98	3·81	1·31	3·43	1·84	0·04	36·15
124	Taveta (D. C.)	2·96	0·25	5·32	3·08				No	Obse	rver.			
125	Thika N'Darugu (Lindsay)	6·47	0·00	6·31	8·36	5·31	0·30	2·31	1·71	0·31	2·08	9·10	0·34	42·60
126	Thika (Trotter)	3·04	0·95	5·55	12·56	5·44	0·02	0·55	3·40	0·37	1·79	7·26	1·13	42·06
129	Uasin Gishu Mooi Ben (Capt. Chapman) ...	0·00	1·85	2·85	3·17	4·37	1·72	8·14	3·52	3·50	3·80	3·50	0·00	36·42
130	Uasin Gishu Kampi Simba (Pardoe) ...	1·89	2·32	3·20	1·35	4·56	1·92	7·25	8·52	2·60	0·80	3·65	0·00	38·06
131	Uasin Gishu (D. C.)	4·18	2·43	2·38	1·20	5·16	3·28	6·86	8·55	3·36	1·33	2·05	0·00	40·78
132	Uasin Gishu Farm 225 (Johnson) ...	3·67	1·03	2·42	5·38	5·74	6·27	8·14	11·11	6·22	1·85	1·89	0·00	53·72
133	Uasin Gishu Farm 121, 122 (Smith & Lovmore)	3·43	2·37	2·44	0·00	4·80	4·41	...	...	...	...	...	...	...
134	Uasin Gishu Buret (Thomson)	3·02	2·09	5·86	2·14	8·43	2·23	7·27	...	...	...	...	...	...
135	Uasin Gishu Farm 128 (Swinton-Home) ...	2·63	1·60	0·00	4·35	6·13	6·32	10·43	9·88	5·68	1·99	1·77	0·41	51·19
136	Ulu Machakos (Lambert & Wilson) ...	1·94	1·08	4·68	2·87	2·89	0·14	0·17	1·16	0·18	0·71	5·05	1·70	22·57
138	Voi (D.C)	3·63	0·03	1·62	0·66	1·66	0·05	0·00	1·67	0·05	1·88	1·34	4·20	16·79

139	Voi Station (U.R.)	...	4·26	0·00	1·10	0·74	0·98	0·07	0·00	1·76	0·07	2·72	1·62	5·30	18·62
143	West Kenia Forest Station (Forester)	...	2·65	0·40	5·81	7·58	6·10	0·43	1·86	2·32	1·44	1·08	9·61	1·61	40·93
144	West Kenia Farm 1248 (Barry)	...	2·95	0·41	1·55	3·61	3·44	0·32	0·78	0·68	0·14	1·35	2·29	N. O.	...
145	West Kenia Farm 1234 (Kenealy)	...	N. O.	0·74	3·85	N. O.	3·00			No	Obse	rver.			
146	West Kenia Farm 1252 (Bayldon)	...	3·20	...	...	...	...	...	...	...	...	...	...	...	...
147	Wire Hill Kisumu (7th Day Advent Mission)	...	4·39	1·89	3·72	7·53	7·74	6·72	2·83	4·92		No	Obse	rver.	
148	Wuzi Voi (C.M.S.) ...	...	9·41	5·83	7·19	7·93	6·39	0·44	0·13	1·40	0·00	3·00	11·35	10·11	63·18
149	Yala Trading Centre	...	4·25	5·94	9·80	8·45	8·49	6·76	5·45	12·87	5·74	7·46	13·91	3·42	92·54
150	Yonti (O./C. Troops)	...	0.00	No	Obse	rver.	...	...	*1·20	2·21	0·82	No	Obse	rver.	
...	New Station ,,	...	...	...	...	...	...	...	...	...	...	...	...	...	...

DEPARTMENT OF AGRICULTURE,
MOMBASA.
JUNE 30th 1915.

THE HON. A. C. MAC DONALD,
DIRECTOR OF AGRICULTURE,
NAIROBI.

SIR,

I have the honour to forward herewith the Annual Report on the Economic Plants Division for 1914-15

SIGNED H. POWELL,
CHIEF OF THE DIVISION.

STAFF.

This was increased by the appointment of a Tropical Agricultural Instructor in the person of Mr. George Farmer who has had large experience in tropical agriculture in British Guiana, Barbados, and the West Coast.

Mr. Farmer arrived and entered on his duties in July 1914, and has so far devoted his attention chiefiy to matters in connection with the Coconut Palm industry. I regard his report, from a practical point of view, on the result of his investigations into the Bud-rot Disease on the Gazi, and Tiur sections of the Uplands and Lowlands Syndicates Concession and the general remarks on the Coco Palm in his annual report, as being valuable contributions to the literature on the subject in British East Africa.

PLANT FOREMAN INSTRUCTOR.

Mr. Dopwell discontinued his duties at the Mazeras Experimental Farm, and was iutrusted with the commencement of the establishment of a system of traps or pits, by the Entomological Division in connection with the movement for the destruction of the Coconut beetle towards which his services have already achieved encouraging results.

MANAGEMENT OF THE MAZERAS FARM.

On my departure from the Protectorate on leave, the management of the Mazeras Experimental Farm was placed in the hands of Mr. H. B. Sharpe, the Departmental Plant and Seed Import Inspector, Mombasa, who carried out the general work of the farm to my entire satisfaction. Mr. Sharpe brought to his assistance, a botanical and horticultural training gained at the Royal Botanic Gardens, Kew, together with a rich fund of energy and enthusiasm in his work.

CHIEF OF THE DIVISION.

The first few weeks of the fiscal year under review was mostly given up by me to matters in connection with the collection, packing and despatch of a representative exhibit of samples of East Africa agricultural products for the International Rubber and Tropical Products Exhibition at the Royal Agricultural Hall, Islington, London, held in June and July.

Simultaneously with the completion of the despatch of the exhibits to London, I was admitted to the Mombasa Hospital suffering from acute "Periostites Tibia" of the left leg; but after the better part of a fortnight's careful medical attention and nursing, I was able to proceed on leave—already overdue—and carried out the installation and other duties in connection with the East Africa Protectorate Stand at the Exhibition alluded to.

An official report dealing fully with all matters in connection with the installation of the exhibit, list of samples and the manner in which these were subsequently disposed of &c., &c., was duly forwarded to the Government of the Protectorate.

The numerous entries in the Visitors' Book which included the signatures of H. R. Highness, Prince Arthur of Connaught and Mr. Lewis Harcourt, showed the wide interest taken in the stand, which from the view point of purely agricultural products, was a prominent feature of the Exhibition and gained general commendation.

Personal enquiries were made by prospective Settlers in the Protectorate; especially in regard to Coffee and Coconut growing, and it is fairly certain that but for the outbreak of war shortly after the holding of the Exhibition, a considerable amount of additional capital would have been invested in Agricultural enterprise in the Protectorate, during the last few months.

REPORTS, CORRESPONDENCE &c.

In addition to the compilation of various official reports, due attention was given to general correspondence. An article on "Fruit Growing in the East Africa Protectorate" written at the request of Mr. A. W. Hill, M.A. Assistant Director of the Royal Botanic Gardens Kew, was published in the Kew Bullentin No. 8, 1914.

KIBWEZI AND MASONGALENI DISTRICTS.

Shortly after my return from leave in January, an inspection was made of the Kibwezi and Masongaleni Estates of the British East Africa Fibre and Industrial Co. Ltd. and advice given to the management in regard to Sisal already established extensively on the properties and other crops considered suitable for the localities.

Voi.—An enquiry was made by me here in connection with damage alleged to have been done by the Military to Ceara Rubber trees, and a detailed report thereon furnished to the Government.

MILITARY MARKET GARDENS.

Practical assistance was rendered the Director of Military Supplies in regard to the selection of suitable sites for the proposed establishment of Military Market Gardens at VOI and MWATATE and the furnishing of estimates of cost and other particulars in connection with the preparation of the land; varieties of vegetables to grow, planting and general upkeep work.

EXPERIMENTAL FARM, MAZERAS.

(APPENDIX **A.**)

The report attached compiled by Mr. Sharpe on the Mazeras Farm, records the steady progress made there, and its further increased usefulness in the matter of the distribution of plants and seeds.

RAINFALL.

The Mazeras district in common with the rest of the Coast littoral has for the past three or four years experienced a lessened rainfall and the long dry season of 1915 was about the worst of all.

Happily the conditions have now changed and at the time of writing this report, the Mazeras and Coast districts generally have received an abundant rainfall; the records for May and June being respectively 16·78 and 11·85 inches=28·63. Europeans long resident at the Coast as well as Natives say that it is necessary to go back for a period of 15 years to find a parallel of such a splendid rainfall as that just recorded; and that we may now reasonably expect a series of favourable seasons.

DWELLING HOUSE AND OFFICE.

The urgent need at the Mazeras Farm is the erection of a suitable dwelling house and office in place of the dilapidated and unsightly present structure.

GENERAL INDUSTRIES.

These were reviewed in last year's report, and that of the previous year; and in these times of stress and tumult it is highly satisfactory to be able to chronicle that with the exception of rubber, the progress of the chief industries of the Protectorate, such as coconuts, coffee and sisal is being maintained.

SUGAR GROWING.

The imports of sugar into British East Africa in 1914 amounted to 74, 485 cwts, of the value Rs. 822,437.

Practical interest is now being taken by several planters in various parts of the country in sugar growing.

There is a keen demand for sugar cane plants at the Mazeras Farm, and planters have assisted in the movement by importing cane plants from Natal for trial on their estates.

At the request of the Hon. Chief Secretary, I recently compiled for the information of the West India Committee, a report and approximate estimate of the extent of land considered suitable for sugar growing in the Protectorate: the aggregate of which amounts to 327, 750 acres. For the purposes of the report only such areas as are known to me and are readily accessible, and immediately suitable for sugar growing were taken into account.

From a purely sugar growing point of view the lower stretches of the Tana River Valley undoubtedly far surpass any other part of the Protectorate; and it is computed there are in the section of country mentioned, about 241,000 acres of rich alluvial land very suitable for sugar cane.

LIME INDUSTRY. (CITRUS MEDICA VAR. ACIDA.)

The prospect of the eventual establishment of a Lime industry in the Protectorate is a matter I have kept in view, in a practical manner, for several years past, with the result that data have now been acquired which prove that the lime tree will flourish and produce good crops of fine juicy fruit over a wide range of British East Africa; and what remains to be done to complete the series of cultural experiments, is to have the acid contents of the fruit ascertained by analysis, towards which attention is being directed.

It appears to me desirable, if not wholly essential that coffee planters in the uplands, should have a reliable, permanent second cultivation to fall back upon, in case the coffee leaf disease should later assume really serious proportions; and taking into account the proved satisfactory manner in which citrus fruits thrive in the coffee districts, the establishment of a Lime industry, and the more extended cultivation of selected varieties of orange, lemon and grape fruit (citrus decumana var.) is worthy of careful consideration.

The Dominica lime trees at Mazeras are growing and fruiting splendidly; and large batches of seedlings are being raised there in case a demand should arise for same.

Fruiting Dominica lime trees are also established and thriving at the Kibos Experimental Farm, and a year and a half ago fruiting trees, raised from the small consignment of Dominica lime seed, were to be seen at the Old Government Farm, Nairobi.

On good land, 18 feet by 18 feet is a suitable distance to plant ; or 134 trees to the acre

DOMINICA LIME PRODUCTS.

The following table of the exports of lime products from Dominica during 1912 will show the great importance the Lime industry is to that Colony :—

Product.	Quantity.	Value.
Concentrated lime juice ...	141,318 gallons	... £38,862
Raw lime juice	508,766 „	... £25,438
Lime juice cordial ...	5,160 „	... £462
Fresh limes	37,038 barrels	... £14,815
Pickled limes	724 „	... £271
Citrate of lime	3,910 Cwt.	... £11,991
Essential oil of limes; distilled oil. ...	4,150 gallons	... £1,816
Otto of limes, hand pressed or eculled oil	1,057 „	... £3,018
	Total	... £96,673

ARROWROOT: (MARANTA ARUNDUNIACEA.)

The cultivation of arrowroot for which certain selected parts of the Protectorate are considered by the Department of Agriculture to be suitable, has been taken up experimentally on a small scale by one or two settlers in the Highlands ; and it was hoped from the data already obtained, that in the course of time an arrowroot industry of some importance would be established. Latest advices just to hand from St. Vincent, West Indies, however, state, that owing to the war the demand for arrowroot has considerably fallen off and the price lowered : and that in consequence the planters in that island were curtailing the area under the crop, and establishing maize and Lima bean, or butter bean instead.

Fortunately, under present circumstances, arrowroot growing has not got beyond the embryo stage in East Africa, but nevertheless the turn of events is disappointing to those interested in the subject.

(Signed) H. POWELL.

30th June 1915.

AGRICULTURAL DEPARTMENT,

MOMBASA.

JUNE 16th 1915.

APPENDIX A.

THE CHIEF OF THE ECONOMIC PLANTS DIVISION,

AGRICULTURAL DEPARTMENT.

MOMBASA.

SIR,

I have the honour to submit my annual report for the year ending March 31st 1915.

Upon your departure for England in May I was instructed to take over the management of Mazeras Farm, as from April 1st 1914.

On June 5th I proceeded to Mazeras with the Hon. The Director of Agriculture when we went over the farm, and I received many instructions from him which I carried out immediately. Subsequently I went up to Mazeras once or twice a week, and when my other work was not pressing, I spent two or three days there, as personal supervision was also necessary.

The old Rubber trees that remained from the former rubber plots were cut down and young specimen trees planted in the old nursery : after this work was done the labour was reduced.

During the year the crops have been fairly good, but the rainfall was not heavy and in the dry season we were badly handicapped for water and many plants were lost. The well water on the farm unfortunately becomes salt during the dry season.

VISITORS.

A number of people visited the farm, but when the local trains were stopped on account of the War visitors were less numerous.

RAINFALL.

The rainfall for the year has not been great, and at times—notably during January, February and March—water was practically unobtainable. 37·34 ins. fell on 81 days: the hightest fall was on October 5th, when 3·69 ins. fell. The month of May was the wettest of the year with a total fall of 6·73 ins. and a greatest fall in one day of 2·01 ins.

Buildings.—In May one of the water tanks was repaired at a cost of Rs. 10/. The farm house which was in a very bad condition required Makuti for the roof on several occasions, and in November the end wall fell down—this has been mended temporarily.

Roads.—Owing to the occasional heavy rains, the roads often need repairs through being washed out. The road passing the front of the house has been continued to the boundary and planted with a hedge of Casuarina on one side, and on the other with Caesalpinia, and bordered with the various Agave species. The road running from the Railway past the house has been continued to the far boundary and the sides have been planted with various palms, ornamental shrubs and cannas backed with hedges : this work is not yet quite finished. The boundary road has also been cleaned and planted on each side with Poincianas and Oleanders. The Rabai road has been cleaned on three occasions during the year.

Stealing.—This has been prevalent at various times during the year, but no thieves have been brought to account except one of the labourers for stealing fruit and he was punished.

Distributions.—These have amounted to 18,731 and have brought in Rs. 1,904-16 (including a small amount refunded on account of freight). 30,477 plants and packets of seed, valued at Rs. 245:55, were distributed free.

The largest distributions have been made in sisal plants, pines, and bananas; also many Bougainvilleas, but these cuttings are somewhat difficult to remove when rooted; the demands have been greater than the supply and large numbers are being planted for later distribution.

Entries.—Plants and seeds have been received from various Botanic Gardens and Stations. The Clove trees from Zanzibar have died, also the Cocoa from Uganda (this never had a fair chance as nearly all the plants were dead or dying upon arrival). Palms from Madagascar have been received, which are all doing well.

Planting.—This was carried out during May, June and July and also to a lesser extent during October and November. The latter planting was not a success except for maize, which did excellently. The chief planting was coconuts, cotton, tree cotton, rain trees for cocoa shade, cocoa, pines, bananas, bamboos and annual crops.

Crops.—Forty five acres were under cultivation and during the year another seven acres have been added for coconut and banana plantations. The chief crops were as follows :— arrowroot, beans, maize, bananas, oranges, limes, pines, pawpaws, jute, cotton, (three varieties) sim-sim, sugar cane and rice.

Arrowroot.—The area of this plot is ½ acre; it is grown for distribution, and during the year has made good growth and

produced firm large white tubers : the distribution was small but one large order was cancelled owing to the War. Unfortunately it is impossible to manufacture the commercial arrowroot, as there is no clear water which is essential in its preparation.

Bananas.—The acreage under imported bananas is 2½ acres. The varieties grown are Red, Guindy and Chinese. The plot includes an old section of ¾ of an acre which is worn out ; only a few bunches were produced from it. The new plantation came into bearing in January with the Chinese varieties ; in March the Guindy varieties commenced to bear. A large number of bananas have been distributed. Many more plants will be available during the coming year.

One half-acre plot has been planted with different native varieties of bananas, of the following :—Kipukusa, Kisukari, Kiki, Kiume, Makona ya Tembo, Bokiboko, Makadha and Chamgamwe.

The Native varieties are used in mixed cultivation with cocoa and coconuts, the area being 18 acres ; six of these were overgrown and worn out : they are now used only as stock plants and later they will be destroyed altogether. The crop has been poor in consequence of this and through the new plantations not being in bearing ; in the coming year it should be very good.

Beans.—One acre was planted with Rose Coco variety beans but the crop was poor and seed was only saved for replanting and ploughing as a manurial crop amongst limes and bananas.

Citrus.—The area under citrus is 2 acres. Zanzibar oranges are doing well and have produced a few very good flavoured and juicy oranges ; also mandarins and limes do very well indeed, but there is no market for the latter and no means of distilling the acid. Of the named varieties of oranges the following are doing well :—Golden Nugget, Du Roi, Bahia Navel, Thompson's Improved Navel, Beauty of Glen Retreat and Washington Navel.

Cocoa.—The plot covers six acres, but this was in such a bad state with weeds and old banana plants that it had to be cleaned three times thoroughly, and rain trees (Pithecolobium samam) planted for shade for the cocoa : the cocoa trees on the farm were moved into their new positions and although great care was taken in the operation, about 50% died.

Possibly had the trees been younger and the rainfall greater so many trees would not have died. Young trees were received from Uganda, but nearly all were dead on arrival. Seed was also received and 30% germinated but it all died during the drought though it was well shaded and watered with fresh tank water (the well water being salt.)

The old trees on the shamba have flowered but have not yet set any pods. The shade trees are planted 30 by 30 feet, and the cocoa when obtainable is to be 10 by 10 feet.

Coconuts.—Area 15 acres, about 5 acres planted in the previous year. One and a half acres were planted in prepared holes with seed nuts after the ground had been cleared, also another plot of the same size was planted with seed nuts in prepared holes in uncleaned ground. The germination was about 80% in both cases and growth is good, but half of those in the bush were destroyed by fire. There are many old trees about the farm, which produce seed nuts ; some of them have been cut down as they were old and useless. Coconut beetles have at times been troublesome but immediate attention by one man with a pointed wire results in many dead beetles. Traps are also used, which are opened about once in six weeks, and the rubbish heaps are also turned over as the beetles breed in them

Cotton.—Area under Abbasi cotton was seven acres. The yields was only fair. Weevil was rather troublesome and all the crop was not gathered on this account and also on account of the lowness of the cotton market. About sixty rupees worth was sold to the Natives for making pillows and beds.

Sixty seeds of a new cotton called Canto cotton were received from Kew ; about 30% grew and made fine plants and produced a good white strong cotton of good staple. Seed was saved and a quarter of an acre planted, which is making good growth. It came recommended as a dry land cotton which seems to be so, for it never flagged once during the hot season, though growing on the driest part of the farm.

Caravonica cotton is planted on a $\frac{1}{4}$ acre plot. It grew well but was badly infested with red spider and had to be cut back.

Three acres are planted with silk cotton or Kapok. The larger trees produced a light crop in December. Those that were stopped to make them grow laterally are spreading out but show no signs of producing a crop. Another $\frac{1}{8}$ acre plot was planted with seed for experimental purposes ; 16 of these were stopped at one foot from the ground, but, as with those stopped at 2 feet, they immediately put out another main growth ; those stopped at 4 feet sent up weakened main stems again, but those which were allowed to make two whorles of branches and were then stopped seem to have lost all tendency for growing upwards and are spreading out laterally. The trees of the Java varieties are making a very fine and compact growth.

Coffee.—Seeds of both Robusta and blue Mountain Coffee were received from the Coffee Adviser. These germinated well but when about two inches high they all died off. Specimens

were sent to the Mycologist and a parasite Fusarium and a saprophyte altrnavia were found.

Jute.—Area of cultivation was 1½ acres. Local seeds from Junda germinated badly, but that from India germinated and grew well, but was not long enough for fibre ; probably because it was not planted till July, instead of at the beginning of the rains. Plenty of seed was obtained and two plots were planted on the 10th of March, which are making good growth.

Maize.—Area under maize for long rains was two acres but one acre of this was very overshadowed by tree cotton, hence, the yield was very poor ; the variety grown was Yellow Hogan.

On October 20th 1½ acres were planted with Yellow Hogan maize and 2 acres with Ladysmith White ; the crops were good especially the Hogan. The returns were five and four bags to the acre respectively. This coming season's crop is making satisfactory growth.

Pines.—The areas under pines are, 2 acres imported, and 2 acres Native varieties. The crops have been abundant and odd fruits have been cut weighing 16 lbs. A new plantation of Native pines was made at the end of February, the old one destroyed. The plot of imported pines was also increased. The distribution of plants has been large.

Rice.—This crop was a failure. The area was 1 acre Upland rice and ½ acre Swamp rice. I cleaned it thoroughly but it was too late and the yield was only one bag to the acre. Early last March ⅛ acre was planted with Upland rice, which is being kept clean and is making excellent growth.

Sugar Cane.—The plot is ¼ acre of the Striped Ribbon and Transparent Bourbon varieties. The growth has been very good. A new plantation of one acre was planted near the Rabai Road in January, and is making good growth. The Uba canes from Natal have been divided up and cuttings taken, and a half acre plot is being planted as the plants are obtainable, and the part planted is doing well.

Sim-Sim.—This crop was planted after beans and rice and made good returns which have been saved for planting and distribution in the coming year.

Paw-Paw.—The majority of the plants in a young plantation died off on account of the ground being too wet. The area was ½ acre. Another ½ acre plot was planted in October and these began to ripen fruit in March.

PUBLIC GARDENS MOMBASA.

During the year it was decided to cut down many of the trees which were beginning to overgrow one another and also to get the different plants together as much as possible ; also to take out some of the stone and replace it with soil and so make new beds. This work has been finished except some of the stone removing. Some of the trees were cut off at 8 or 10 ft. from the ground and creepers planted to grow over them. The main walks were edged with Agave vivipara in the place of Pedilanthus. The Bamboo near the Bank was cut back somewhat as it was harbouring mosquitoes. The Coronation Bamboo was moved to the Station end of the Garden. A small fernery was planted round the well with local ferns and Cladiums and a shelter built in the centre of the garden and Bouganvilleas planted round it. Zinnias and other annuals made a bright show from July to December. The Bougainvilleas have been a success the whole year round, never flagging even in the drought.

A collection of palms was received from Madagascar and an avenue planted by one of the main walks ; also one of each species was planted by the Station. Bougainvillea lateritea and some Bagonias were grown by Capt. Eustace ; the former are doing well. Many ornamental plants and trees were brought from Mazeras and planted, the majority of which, as well as the palms are growing and doing well : white ants and drought took toll of a few. The garden looked very desolate and bare during the dry season, which will always be the condition until water can be obtained.

Plants of Interest.—The following trees and plants have flowered during the year:—Cassia grandis, C. fistula, C. sp. (yellow) C. sp. (pink). Bauhinia tomentosa, B. varoegata, B. alba, Caesalpinia coriaria, (divi-divi dye), C. Pulcherrima, C. sp. (yellow flowering tree) C. sp. (yellow flowering shrub) Moringa pterygosperma, Poinciana regia, Bombax malabarica (with large yellow rose like flowers) Allamanda nerifolia, A. grandifora, A. violacea, Theobrama cacao, Bougainvilleas, Largestroemia Flos-reginae, Hibiscus arboreus, Bibnonia vonusta, Bixa orellana, Porana paniculata.

The bread fruit trees have set their fruit in abundance many times in the year but they always fail to mature them. Either too much or too little rain will cause the fruit to fall prematurely and these trees get an excess of both during the year. Their roots have been exposed and scraped to encourage suckers but only two have yet grown, and they died when they were removed from the parent plant.

The bamboo avenue by the Railway is beginning to be a conspicuous feature and good rods are formed, all gaps in it being made good. Clumps that were growing near the coconuts and starving them have been removed. There has been a good demand for plants especially those of the male bamboo, but we

have only one plant in the garden and that is not yet big enough to stand young plants being removed from it. Poles have been supplied to the Military for use as hammock poles, and to Planters for making light ladders for Natives to ascend the coconut trees in search of beetles.

Camphor, Cinnamon and Cocaine trees are doing well. The last Vanilla plant died during the drought.

A collection of palms was received from Madagascar, and out of these the following have done well :—Creodoxa regia, Phoenix leonensis, Caryota urens, Sabal palmetto, Latania sp., Arenga saccharifera, Areca lutescan and Cocos plumosus : Areca catechu (Betel nut) and Borassus flabelliformis have been obtained locally and are doing well.

In January I went to Gazi and Msambweni to inquire into the locality of the Raphia palm on the Coast, and the possibility of it becoming useful for the making of Bass Brooms.

I found it growing in abundance in, or within a few yards of water. A sample of fibre and bass was obtained and sent to Nairobi, and young plants of that and of the oil palm were obtained.

Of the palms previously in the Garden some of the Poitchardias have made good growth, but two have died. Chrysalidocarpus sp. is showing a flowering spike. The following are doing well :—Hyophorbe verschaffelti, Phoenix dactilifera, P. reclinata, Crytostachys renda, Corypha umbraculifera.

Hedges.—The hedges of the Garden are always noticeable, The established ones are Duranta, Inga dulcis, Logwood, Acalypha, Dodonea and Caesalpinia, and they have been kept cut and trimmed.

New hedges have been planted of :—Aralia guilfoylei, Caesalpin sp. (this is proving exceptionally good, as it has thorns on both leaves and stems and would stop anything from passing) and Casuarina (this is good whilst small but it remains to be seen whether it will stand continual cutting).

Borders.—Annual and perennial flowers, ornamental and flowering shrubs have been planted in the borders near the main roads and have made a very good show, especially the Zinnias and Petunias. The flower beds have been kept clean and planted in the same way as the borders.

Nursery.—The old nursery has been changed and is now being planted with various tropical fruit trees as they are obtained. Sapodilla plums planted during the short rains died. Soursops, sweetsops, shaddocks, limen, litchis and Zanzibar oranges are being planted. A new nursery was formed at the end of the old one and planted with seeds and cuttings of economic and ornamental plants for home planting and for distribution.

A new piece of ground is being prepared for the plants for distribution in March, 1916, and the present one will be cleared and rested. The new plot will be shaded with bananas only as it is found that the roots of bamboos travel too far.

Diseases and Pests.—These have not been bad. Coconut beetles have at times been rather tiresome, their grubs even being found in old Ceara rubber stumps, but with regular and careful supervision they can be kept in check. The Acacia borer was found on two occasions. An insect attacked some of the Ubasugar canes, and specimens were sent to the Entomologist but no culprit could be found. Coccos were present on some of the Citrus and Palms, which were dressed with parrafin emulsion. Cocoa and coffee seedlings were killed and the Mycologist found a parasite "Fusarium" and a saprophyte "Alternaria" present on specimens sent to him. Cotton was attacked by weevil. Cotton stainers were also present on the cotton and other malvaceous plants.

Specimens of various economic products were sent to the Museum at head Office, which included:—Canto, Caravonica and silk cottons, Maize, Sim-sim, Arrowroot, seeds and seed pods of Circassian bead tree, Oil of ben, Mbemba kofe, Logwood, Jute, Arnatto dye, Coconuts.

Altogether in spite of the climatic drawbacks the Garden has improved in appearance during the year. The sale of surplus produce has greatly increased, and the stock in the Garden has not been depleted, but rather increased.

I have the honour to be,

Sir,

Your obedient servant,

(*Signed*) H. B. SHARPE,

Acting Foreman in charge.

ANNUAL REPORT

OF THE

GOVERNMENT EXPERIMENTAL FARM,

KIBOS,

FOR THE YEAR ENDING MARCH 31ST 1915

THE HON. DIRECTOR OF AGRICULTURE,

Nairobi.

Sir,

I have the honour to submit my report on the Government Experimental Farm, Kibos, and Agricultural Instruction work carried out in the North Kavirondo and Kisumu districts, for the year ending March 31st 1915.

STAFF.

The staff remained unchanged during the year.

The Native young man John Paul who was appointed last year as Senior Headman to take charge and supervise the work on the farm during my absence on safari, proved fairly satisfactory.

REPAIRS AND ADDITIONS TO BUILDINGS &c.

Minor repairs were carried out to the store, tobacco curing shed, and labourers huts. New wooden supports were put in along the sides of the farm bungalow, which continued in the same dilapidated condition as mentioned in reports of past years.

At the present juncture, when the curtailment of expenditure has become a general necessity in practically all departments of Government, it is of course hardly to be expected that money will be spent on new buildings on the farm; it would however undoubtedly be a great economy if such repairs as are urgently needed to the farm bungalow could be carried out with as little delay as possible.

RAINFALL AND WEATHER CONDITIONS.

The rainfall conditions which prevailed during the year were somewhat the reverse of previous years.

In the one the long rains were plentiful and fairly well distributed, while the short rains practically failed: in the other the long rains practically failed, whilst the short rains were earlier and more plentiful than they had been for years. These unseasonal rains being more or less of a general character not only interfered with the success of some of the short crop experiments, such as those with cotton and maize carried out at this farm, but seriously affected the output of these commodities throughout the whole of the Kisumu and Mumias districts.

No very severe thunderstorms occurred, and though high north easterly winds were of frequent occurence, neither these nor the two hailstorms which were recorded did any serious damage.

Rainfall Table for 1914-15.

Month.	Quantity in inches.	No. of days. rain fell.	Greatest fall.	
			Date.	Inches.
April	2·09	9	7th	·30
May	4·15	17	8th	·60
June	1·72	6	8th	1·00
July	1·86	8	22nd	1·50
August	4·80	16	3rd	1·40
September ...	6·48	17	18th	1·30
October	·97	5	25th	·60
November ...	9·17	14	27th	1·87
December ...	4·76	9	15th	1·40
January	4·15	7	13th	1·05
February ...	·47	2	27th	·36
March	4·23	14	28th	·94
Total ...	44·85	124	...	...

EXPERIMENTS.

No very important changes were made or departures introduced in the farm experiments, which as heretofore were divided into short and permanent crops, and consisted of a series of trials to test the suitability to the conditions at Kibos, and to arrive at some definite idea regarding the best distances and methods of planting which should be employed in dealing with them,

In spite of the drawbacks caused by the unfavourable weather conditions already referred to, several of these experiments such as cotton and maize, planted as they were, practically alongside the same crops grown by the Indian farmers, furnished undeniable proof regarding the value of proper distances in planting and constant cultivation when dealing with these crops.

The area occupied with experiments generally showed a slight increase over that of previous years.

No new land was brought under cultivation.

The following is a list of crops grown shewing area occupied by each:—

SHORT CROPS.

Planted during the long rains.

Groundnuts	3 acres.
Cotton	10 „
Chillies	1 „
Upland rice	2 „
Tobacco	2½ „
Maize	18 „
Castor oil	2 „

Planted during the short rains.

Beans	3 acres.
Sim sim	1 „

Permanent Crops.

Bananas	5 acres.
Coffee	3 „
Fruit trees	4 „
Timber trees	5 „
Pine Apples	½ „

BEANS.

Three varieties of bean, viz.-Canadian Wonder, Rose Cocos, and Moldavia Round White were included in this experiment, which on the whole produced fairly good results.

Although previous experiments had shown that owing to the comparative low yield this crop produces at Kibos, it was hardly to be recommended for growing as a main crop in the district. It had nevertheless proved its value as a catch or cover crop, planted towards the end of the long rains or at the commencement of the short rains.

Table of Results.

Variety.	Date of Planting.	Date of Harvesting.	Yield per Acre.
Rose Cocos ...	August 4th.	Dec. 10th.	512
Canadian Wonder	„ „ 20th.	Dec. 29th.	700
Moldavia White.	„ „ 5th.	Dec. 14th.	318

Chillies.—Owing to the low germination of the seed of the Nyassaland variety, the chief object aimed at in this experiment, viz:—the making of a careful comparison between this variety and the Mombasa variety as main crops for Kibos was not attained. Seed of both varieties were planted in the nursery late in February, but the Nyassaland variety only gave a 40% germination as against a 100% by the Mombasa variety.

The young plants were transplanted from the nursery late in April, but for reasons already stated, as well as the fact that the plot in which the experiment was carried out, was wanted for other purposes before the Nyassaland variety came into full bearing, the experiment can hardly be said to have had a fair chance.

Both these varieties have proved their suitability to the Kibos conditions, though the Mombasa variety, which is a much larger chillie, being easier and therefore cheaper to harvest, has to the present had greater popularity amongst growers in the district.

Where there is an abundance of cheap labour however, the Nyassaland variety, owing to its perennial nature, should prove invaluable as a catch crop, grown in conjunction with coffee or fruit trees.

Chillies are rapidly becoming popular as a Native crop in these districts.

Table of Results.

Variety.	Date of Planting.	Date of Harvesting.	Yield per Acre.
Mombasa	April 3rd.	June 2nd.	200 lbs.
Nyassaland ...	April 5th.	No returns.	

Cotton.—Not only these experiments, but the whole of the crop planted in the Kavirondo country-which as regards area, was the biggest planted in any one year since the industry was taken up by the Natives—were, from a standpoint of yield, the poorest since the year 1909, in which year the crop failed altogether.

The poorness of yield, was due, not so much to the drought experienced during the early part of the planting season, but more particularly to the abnormal rains, which occurred at a period of the season when not desired.

In consequence of these unseasonable rains, the cotton plants developed a rank growth of bush and wood at the expense of yield.

In most important particulars, the experiment at the farm was similar to that of the preceeding year, being divided into two distance experiments of 5 acres each: one planted 4' x 2' and the other 5' x 2'.

Both experiments did equally well in the growing stage though as regards bearing qualities the 5' x 2' experiment was somewhat the better. The seed used was a variety of American upland from Uganda.

Table of Results.

	Date of Planting.	Date of Harvesting.	Yield per Acre.
5' x 2'	April 25th. ...	Aug. 3rd to Dec. 11th.	310 lbs.
4' x 2'	May 10th. ...	Aug. 3rd to Dec. 18th.	360 lbs.

Castor Oil.—The results with this experiment were disappointing in view of the healthy vigorous growth the plants maintained, practically up to the time of harvesting.

The ground for this experiment was prepared as heretofore in little hillocks 6 feet apart, and two seeds sown in the centre of these. The plants which were thinned out to a stand of one to each hillock, commenced to flower profusely in June, but for some reason I cannot explain, only a small per centage of the flowers matured their fruits.

TABLE OF RESULTS.

Variety.	Date of Planting.	Date of Harvesting.	Yield per Acre.
Native small Seeded variety.	June 15th.	Sep 12th.	500 lbs.

Groundnuts.—This was a catch crop experiment planted between young timber and coffee trees. In both cases the yield was lower than it had been in either of the previous experiments, owing in the case of the coffee plot, to the plants getting too much shade from the banana trees which were shading the young coffee, and in the case of the eucaliptus, to late planting.

From its very habit of growth, and the power the plant possesses of storing nitrogen in the soil, this crop will always command attention as a catch crop.

TABLE OF RESULTS.

Variety.	Date of Planting.	Date of Reaping.	Yield per Acre.
Originally from Shirati.	March 3rd.	Sep. 11th.	1,000 lbs.

Maize.—This experiment in common with the crop throughout the whole district suffered somewhat both as a result of unfavourable weather conditions, and an attack of caterpillars when the plants were young. So great indeed was the damage done by caterpillars that the Indian growers found it necessary to plough in and replant several hundreds of acres, which were put under with hickory king maize early in February and March.

Although the yield of the two varieties included in this experiment, *viz.*:—White Hickory King and Yellow Hogan was owing to the above mentioned causes much below the average, this experiment, by reason of its close proximity to several of the Indian plots, furnished very striking demonstration of what proper distances in planting and constant cultivation mean with maize growing.

Towards the end of the year renewed efforts were made with a view to interesting the Natives of the Kisumu district in the cultivation of the Hickory King variety. These are being attended with fairly satisfactory results.

TABLE OF RESULTS.

Variety.	Date of planting.	Date of harvesting	Yield per acre.
Hickory King	Feb. 25th	July 25th	1,100 lbs.
Hogan	March 10th	August 14th	1,000 lbs.

Upland Rice.—A three acre catch crop experiment was tried with the same variety of this crop which produced such excellent results at the farm two years ago ; but owing to the drought which set in shortly after planting no results followed.

Although the water requirements of this crop is not so great as those of the swamp varieties being grown by the Natives in parts of Mumias and Kisumu districts, prolonged periods of drought, when the plants are still young, invariably causes a set back, from which they seldom recover. On the other hand, in good seasons this variety produces an average yield of 7 to 8 bags of paddy per acre.

TABLE OF RESULTS.

Variety.	Date of planting.	Date of harvesting.	Yield per acre.
Upland.	Feb. 18th	...	No return.

Sim-Sim—It was proposed to put in a five acre experiment with this crop, but finding it impossible with the one team of 16 oxen to get the land for the other experiments, as well as the land for this one ready in time for planting, towards the end of the long rainy season, which previous experiments had shown was the best time for sowing the crop at Kibos, only half an acre of land which was ready at the time was sown. This did very well, though since the seed of the imported varieties through a mistake was mixed with the Native variety, which was being tried some three years ago at the farm, the yield per acre produced before this occurred is now considerably lower.

The Native crop in the Kavirondo country during the year has been the biggest on record, and the tendency is towards further extending the industry

TABLE OF RESULTS.

Variety,	Date of planting,	Date of harvesting.	Yield per acre.
Imported	May 6th	Aug. 25th	280 lbs.
Native	May 10th	Aug. 25th	197 lbs.

Tobacco.—This exeperiment which was planted as a catch crop between the rows of young fruit trees, included the following four varieties ;—

1 Connecticut seed leaf:
2 Hester
3 Gold-finder:
4 White Burley.

Three fortnightly sowings were made with seed of each of the kinds named, commencing in the middle of February. Germination was good in each case and the plants developed quite well in the nursery. Owing, however to the dry condition of the weather which occurred shortly after the transplanting of the Connecticut and Hester varieties, a large percentage of these died; and though steps were taken to fill in the vacancies so caused with as little delay as possible, there was a very uneven stand of plants when the time of harvest came.

The black cotton soil at Kibos is not considered generally suitable for growing the lighter grades of tobacco, but with careful attention to such matters as distances in planting, constant cultivation, time to top and sucker the plants, it seems possible to produce a leaf of good size and medium strength.

The distance at which the plants were put out in this experiment was 3' x 18".

The tobacco was cured in a mud and grass hut, but owing to the excessive damp conditions which prevailed for considerable periods at a time during the curing process, mildew made its appearance and soon spread rapidly through the tobacco, doing considerable damage.

TABLE OF RESULTS.

Variety.	Date of planting.	Date of harvesting.	Yield per acre.
Connecticut seed leaf.	April 16th	July 9th	310 lbs.
Hester.	do	July 18th	300 lbs.
Gold-finder.	April 27th	Aug. 9th	500 lbs..
White Burley.	do	do	470 lbs.

Fruit Orchard.—Fair progress towards the establishment of a Tropical Fruit Orchard at the farm was made during the year. Suitable pruning and dressing off was done to the young plants, and well decayed farm yard manure applied to all the old

trees as well as to the young ones. A number of plants were raised in the nursery, and these, together with a small consignment from the Kabete Farm, have made a most useful addition to those already planted including the following:—

Banana,
Coconuts,
Guavas,
Mangoes.
Oranges, and Papaws.

Also Pine Apples,
Sugar Apples,
Mulberry, and Figs.

Bananas.—Both the local and imported varieties made good progress. The three plants of Dwarf Chinese produced fruit for the first time during the year. The Guindy and Lady's Finger variety continue to attract attention, and applications for these plants have been on the increase.

It is gratifying to note the extent to which the cultivation of these fine fruits is being taken up. This should in time result in fulfilling a long felt want, *viz.* :— the providing of a regular supply of good fruit for the local market.

Coconuts.—So far none of the older trees which commenced fruiting two years ago, have matured any fruits; though some of these latter were nearly matured when they fell off. It is hoped that the younger trees—a few of which should come into bearing during next year—will show some improvement in this direction, since the cultural requirements of these trees received closer attention then the older ones.

Guavas.—These plants made good progress and produced a heavy crop of fruit.

Cashew Nuts.—Two of the 3 year old plants came into bearing during the year. The size and general quality of the fruit from this first bearing, was below the standard of that possessed by the Coast fruit.

Citrus Fruits.—A welcome addition to the plants in this class was made towards the end of the year, when a consignment of 30 grafted plants—including oranges, grape fruit, lemons, and limes—was received from the Kabete Farm.

The four-year old orange trees produced a fair crop, whilst the older sour oranges, rough lemons, and mandarine oranges, have been more or less in full bearing during the year.

Mangoes.—Although the size and quality of the fruits produced by the old trees continued excellent, the crop produced was very small; and this in spite of the freedom with which the trees flowered. The planting was too close in the first

instance, and possibly this accounts for the poor yield. The younger trees made good growth, and in view of the more suitable distances at which they were planted, should produce better cropping results.

Giant Papaws.—The fruits of these trees deteriorated somewhat in size though the quality remained good.

Arrangements were made for raising a number of seedlings for planting in the fruit plot, and to meet the outside demand which continues to be considerable.

OTHER ECONOMIC PLANTS.

Sugar Cane.—The six cuttings of Uba sugar cane planted on the western end of the fruit plot produced some fine bunches of well developed canes. These canes compared with the ordinary variety of white transparent grown on a fairly large scale by the Indians at Kibos, is very small indeed; but its hard rind and its drought resisting qualities make it most suitable for growing in dry districts.

Kapok.—These plants made slow growth during the year, and on the whole do not appear to be as much at home here as at the Coast. Two of the plants produced a few pods each, but these did not mature.

Coffee.—This experiment consists of plants varying in age from three to seven years, all of which made excellent all-round progress. Towards the end of the year an additional two acres of land was planted with banana plants, to provide shade for young coffee plants, to be transplanted to this plot during the next rains.

The older trees produced a heavy crop of berries during the year, and at the time of writing, both these and the younger trees are bearing profusely. Much interest continues to be centred in this crop at Kibos, where the British East Africa Corporation has put in about 50 acres; the older trees of which should be coming into bearing next season.

Timber Plot.—Owing to the difficulty experienced to raise the necessary supply of plants, only half of the remaining three acres to complete the planting out of this plot, was done.

Two consignments including 300 Casuariva and 200 Grevelea plants were received from the Forestry Department during the year. These, together with young plants of Eucalyptus and Iron wood put out from the nursery, have raised the area under timber to six acres.

Already this plot is proving of immense value to the farm, as a source of supply of suitable timber for building and fencing purposes.

The measurements of the best trees are as follows :—

Name of tree.	Height.	Girth: 1' from base.
Eucalyptus	30'	24"
Black Wattle	27'	21"
Iron Wood.	25'	12"
Casuariva	18'	13"
Grevelea Robusta	21'	11"

DISTRIBUTION OF PLANTS, SEEDS &c.

There has been a marked increase in the number of applications for, and enquiries about economic as well as ornamental plants and seeds during the year.

Although a number of these applications were received from such widely separated parts as the Uasin Gishu, Lumbwa, Muhoroni and Nakuru; the increased demand for plants may also be traced to the gradual awakening, on the part of the Native Chiefs and Headmen in regard to the value of the more improved varieties of crops being grown at the farm.

DISTRIBUTION LIST.

Name.	No. of plants.	Quantity of seed.	Remaks.
Bananas	1,075	...	To Natives.
Beans	...	¼ Ton	do
Chillies	...	70 lbs.	do
Papaws	30	....	Europeans
Limes	54	...	Europeans and Natives.
Lemons	30	...	do
Pine Apple	62	...	do
Maize	...	8 Tons	Natives.
Rice (Upland)	...	2 Cwt.	Europeans and Natives.
Sugar Cane	25	...	Natives.
Sim Sim	...	280 lbs.	Europeans and Natives.

Live Stock.—Notwithstanding the constant hard work to which we were obliged to put the oxen (16), the condition of the animals remained, on the whole satisfactory.

In order to relieve the strain these animals are obliged to bear, also to make possible the gradual extension of the present cultivated area at the farm, from 10 to 18 additional oxen are urgently needed.

The mule formerly attached to the farm was taken over by the Military shortly after the outbreak of war.

LABOUR.

No difficulty was experienced regarding labour which was drawn from the Ju Luo and Maragoli in the neighbourhood Current rates of wages being Rs. 5/- to Rs. 7- without posho.

There has been a distinct increase in the number of boys from the Mumias district applying for work at the farm.

Visitors.—The number of visitors both of Europeans,—amongst whom were settlers from the Uasin Gishu, Lumbwa, and Muhoroni—and Natives were considerably more than heretofore. The Natives included chiefs and headmen from the Nandi. Kisii. Mumias and Kisumu districts.

Administrative officers—including the Assistant Provincial Commissioner, visited the farm.

One visit was paid by the Chief of the Economic Plants Division early in the year.

AGRICULTURAL INSTRUCTION.

As in previous years, itnierant tours were undertaken througout the Mumias and Kisumu districts in connection with Native cultivations.

Although the development of the Cotton industry occupied a considerable portion of the time devoted to Agricultural Instruction work, other matters ¼ touching the agricultural welfare of these districts also received attention. Prominent among these mention might be made about swamp land cultivation, which has gradually been assuming considerable proportions throughout these districts. The original idea which led to the starting of swamp cultivation in these districts, was, to provide against possible shortages in the Native food supply in years of protracted drought, an occurrence which is not infrequent in parts of the Kavirondo country.

But in carrying out this idea Native agriculture indirectly benefited. Since the use of English agricultural tools, such as the English hoe, became more and more widespread as the work proceeded.

The crops grown in these swamps include: beans, bananas, rice, maize, and sugar cane; all of which in cases where the draining arrangements were effectively carried out, produced good results.

With regard to the cotton crop, a number of circumstances combined to bring about the disappointing results which it produced; the more important of these, being, unseasonable rains which occurred, resulting in the comparatively low yield of seed cotton obtained; also the outbreak of war, which brought about a big fall in prices.

Besides the above mentioned tours; visits were paid to the Indian settlements at Kibos and Muhoroni, to advise regarding cotton cultivation: also to the Government Prison shamba at Kisumu, and several of the Mission Stations, to advise regarding the crops being cultivated at these places.

I have the honour to be,

Sir,

Your obedient servant,

(*Signed*) H. H. HOLDER,

Plant Instructor.

ANNUAL REPORT

OF THE

ENTOMOLOGICAL LABORATORY

FOR THE

YEAR ENDING 31ST MARCH, 1915.

ENTOMOLOGICAL LABORATORY,

KABETE, *May* 1915.

THE HONOURABLE,

THE DIRECTOR OF AGRICULTURE.

SIR,

I have the honour to submit herewith my Report for the year ending March 31st. 1915.

For over seven months of the year I have practically been without the services of my Assistant, R. H. Deakin, Esq., M. Sc.

Mr. Deakin was in Hospital from the 21st to the 28th April suffering from a bad attack of dysentery. On September 17th he was permitted to join the East Africa Mounted Rifles, but had to resign on the 28th of October owing to a return of his illness. He was finally invalided home and left Mombasa for England on the 6th of January. During the periods which he spent at Kabete, between April and January, he was practically an invalid, and, though he was keen to do so, could take little or no part in the work. The research work which he had begun had to be abandoned.

I was away from the Laboratory for the following periods:—
April 10th—16th, Mombasa, Coconuts;
Nairobi for six weeks, Commission Report;
January 20th—26th, Mombasa, Plant Imports;
March 9th—14th, Naivasha.

This does not include excursions to the plantations in the Kikuyu, Kyambu, and Limoru ditricts.

Mr. Deakin was on safari for the following periods:—
May 9th—June 9th, Kisumu and Kericho districts;
June 18th—June 19th, Kyambu;
Novr. 2nd—to Novr. 17th, Mazeras, Rabai, Mombasa,

Mr. H. B. Sharpe, Plant Import Inspector, was in charge at Mazeras while Mr. Powell was on leave.

Mr. Dopwell, Plant Instructor, has been in charge of the coconut beetle traps. He has now gone on leave and the work is being done by Mr. Farmer, Tropical Agricultural Instructor.

No report was received from Mr. Dopwell before he left the Protectorate.

PLANT IMPORT AND INSPECTION.

Consignments to the number of 786 and valued at Rs 43,642 were passed for entry into the Protectorate.

Eleven consignments valued at Rs. 116, were confiscated.

In transit to the Belgian Congo, Uganda, and German East Africa, 46 packages valued at Rs. 1,192 were passed.

1,365 tons of maize were exported, of which 90 tons were fumigated prior to shipment.

Details of these imports and exports will be found in Mr. Sharpe's report which is attached.

THE ECONOMIC INSECTS OF THE PROTECTORATE.

This year, instead of dealing with each crop separately, I propose to give a preliminary list of the Economic Insects of the Protectorate as far as they are known, with a few notes on each, their distribution, and the plants attacked.

A collection is being made of the indigenous food plants, but, as only a few of these have been named, the list will be submitted later.

With regard to the distribution only those localities are given from which specimens have been received.

A PRELIMINARY LIST OF THE ECONOMIC INSECTS OF BRITISH EAST AFRICA.

Lepidoptera.

NYMPHALIDÆ	1.	*Pyrameis cardui*, L.
PAPILIONIDÆ	2.	*Papilio demodocus*, Esp.
	3.	*Papilio mackinnoni*, Em. Sharpe.
	4.	*Papilio lyaeus, Doubl.*
LYCÆNIDÆ	5.	*Lampides boeticus*, L.
AMATIDÆ	6.	*Metarctia rubipuncta*, Hmp.
ARCTIIDÆ...	7.	*Diacrisia investigatorum*, Karsch.
NOCTUIDÆ	8.	*Chloridea obsoleta*, F.
	9.	*Euxoa segetum*, Schiff.
	10.	*Euxoa spinifera*, Hubn.
	11.	*Polia inferior*, Guen.
	12.	*Laphygma exempta*, Walk.
	13.	*Prodenia litura*, F.
	14.	*Spodoptera mauritia*, Boisd.
	15.	*Grammodes geometrica*, F.

16. *Plusia orichalcea*, F.
17. *Cosmophila erosa*, Hubn.
18. *Earias insulana*, Boisd.

LYMANTRIIDÆ ...19. *Orgyia vetusta*, Hamp., var.
20. *Porthesia producta*, Wlk.
21. *Naroma signifera*, Wlk.

SPHINGIDÆ ...22. *Hippotion celerio*, L.
23. *Herse convolvuli*, L.

SATURNIDÆ ...24. *Nudaurelia* sp.

COSSIDÆ ... ...25. *Duomitus capensis*, Wlk.

LASIOCAMPIDÆ ...26. *Metanastria distinguenda Auriv*,

LIMACODIDÆ ...27. *Parasa*, sp.

OLETHREUTIDÆ...28. *Argyroploce leucotreta*, Meyr.

PYRALIDÆ... ...29. *Thliptoceras octoguttalis*, Feld.

TINEIDÆ ... ...30. *Gelechia gossypiella*, Saund.
31. *Phthorimaea operculella*, Zell.
32. *Sitotroga cerealella*, Ol.
33. *Cemiostoma coffeellum*, Staint.
34. *Plutella maculipennis*, Curt.

COLEOPTERA.

MELOLONTHIDÆ

Melolonthinæ ...35. *Schizonycha kolbei*, Brenske.
36. *Schizonycha*, sp.
37. *Camenta*, sp.
38. *Trochalus*, sp.
39. *Serica*, sp.

Rutelinæ ... ...40. *Anomala kersteni*, Gerst.
41. *Adoretus punctipennis*, Fahr.

Dynastinæ ... ...42. *Oryctes monoceros*, Ol.
43. *Oryctes boas*, F.

Cetoniinæ ... ...44. *Elaphinis adsperula*, Gerst.
45. *Rhabdotis virginea*, Klug.
46. *Pachnoda sinuata*, F.
47. *Diplognatha silicea*, MacL.
48. *Oxythrea elegans*, Klbe.

CARABIDÆ ...49. *Scarites taciturnus*, Chd.
50. *Carabomorphus brachycerus*, Gerst

COCUJIDÆ... ...51. *Laemophloeus minutus*, Ol.

COCCINELLIDÆ ...52. *Epilachna hirta*, Thb.
53. *Epilachna similis*, Thb.
54. *Epilachna chrysomelina*, F.

DERMESTIDÆ ...55. *Dermestes vulpinus*, F.

BOSTRYCHIDÆ ...56. *Apate monachus*, F
57. *Bostrichoplites cylindricus*, Fahr.

ELATERIDÆ ...58. *Tetralobus flabellicornis*, L.

TENEBRIONIDÆ ...59. *Pharnocolus crispatus*, Fairm.
60. *Gonocephalum simplex*, F.

LAGRIIDÆ... ...61. *Lagria villosa*, F.

CANTHARIDÆ	62.	*Epicauta nyassensis*, Haag.
	63.	*Mylabris praestans*, Gerst.
	64.	*Mylabris apicalis*, Guer.
	65.	*Mylabris amplectens*, Gerst.
	66	*Mylabris sjostedti*, Borch.
BRUCHIDÆ	67.	*Bruchus chinensis*, L.
CHRYSONELIDÆ	68.	*Syagrus puncticollis*, Lef.
	69.	*Ceralces ferrugineus*, Gerst.
	70.	*Idacantha magna*, Weise.
	71.	*Ootheca bennigseni*, Weise.
	72.	*Megalogntha metallica*, Jac.
	73.	*Monolepta leuce*, Weise.
	74.	*Monolepta nigrisuturalis*, Jac.
CERAMBYCIDÆ	75.	*Mallodon downesi*, Hope.
	76.	*Anthores leucomotus*, Pascoe.
	77.	*Coptops aedificator*, F.
	78.	*Phryneta spinator*, F.
	79.	*Ceroplesis conradti*, Klbe.
	80.	*Dirphya*, sp.
CURCULIONIDÆ	81.	*Systates cribripennis*, Fairm.
	82.	*Cylas formicarius*, F.
	83.	*Cryptorrhynchus mangiferae*, F.
	84.	*Rhynchophorus, phoenicis*, F.
	85.	*Calandra granaria*, L.
	86.	*Calandra oryzae*, L.

RHYNCHOTA.

PENTATOMIDÆ	87.	*Nezara viridula*, L.
	88.	*Bagrada picta*, F,
	89.	*Antestia variegata*, Thb., and var. *lineaticollis*, St.
	90.	*Agonoscelis puberula*, Stal.
	91.	*Agonoscelis versicolor*, F.
	92.	*Calidea apicalis*, Sch.
	93.	*Sphaerocoris annulatus*, F., var. *ocellatus*, Klug.
LYGÆIDÆ	94.	*Oxycarenus hyalinipennis*, Costa.
PYRRHOCORIDÆ	95.	*Dysdercus superstitiosus*, F.
	96.	*Dysdercus nigrofasciatus*, St.
COREIDÆ	97.	*Leptoglossus membranaceus*, F.

OROTHOPTERA.

ACRIDIIDÆ	98.	*Pachytilus sulcicollis*, Stal.
	99.	*Chrotogonus hemipterus*, Scham.
	100.	*Zonocerus elegans*, Thb.
	101.	*Zonocerus variegatus*, L,
	102.	*Phymateus viridipes*, Stal.
	103.	*Acridium aeruginosum*, Stoll.
	104.	*Schistocera tartarica*, L,

	105.	*Schistocera peregrina*, Ol.
GRYLLIDÆ...	...106.	*Brachy trypes membranaceus*, Drur.

HYMENOPTERA,

TENTHRIDINIDÆ...	107.	*Athalia*, sp.
APIDÆ ...	...108.	*Xylocopa flavorufa*, Geer.
	109.	*Xylocopa nigrita*, F.

PHYTOPHTHIRES.

PSYLLIDÆ	...110.	*Trioza*, sp.
APHIDIDÆ	...111.	*Macrosiphum lycopersicella*, Theo.
	112.	*Macrosiphum antirrhinum*, Macchiate.
	113.	*Macrosiphum granarium*, Kirby.
	114.	*Aphis brassicae*, L.
	115.	*Aphis gossypii*, Glover.
	116.	*Aphis tavaresi*, Del Guer.
	117.	*Aphis rumicis*, L.
	118.	*Aphis africana*, Theo.
	119.	*Toxoptera aurantii*, Boyer.
	120.	*Toxoptera Graminum*, Rond.
	121.	*Eriosoma lanigera*, Haus.
COCCIDAE	...122.	*Chrysomphalus aurantii*, Mask,
	123.	*Mytilaspis beckii*, Neum.
	124.	*Ceroplastes ceriferus*, And.
	125.	*Lecanium africanum*, Newst.
	126.	*Lecanium hemisphaericum*, Targ.
	127.	*Lecanium nigrum*, Niet.
	128.	*Pulvinaria psidii*, Mask.
	129.	*Dactylopius citri*, Risso.
	130.	*Icerya purchasi*, Mask.

1. **Pyrameis cardui,** L.—The Painted Lady. Caterpillars on Artichokes, (Cynara scotymus); Kabete; numerous from May to December.

2. **Pepilio demodocus,** Esp.,— The Common Citrus Butterfly. Considerable damage done to nursery stock by the caterpillars; not much damage to established trees; in one nursery many seedling plants of the rough lemon were completely defoliated and the tips of the shoots destroyed; many of these plants died; this is exceptional and the pest can be controlled by hand picking.

3. **Papilio mackinnoni.**—Em. Shpe., and *P. lyaeus*, Doubl. The caterpillars of these two Papilios were fairly common at Kabete during 1914-1915 on Citrus. The caterpillar of *mackinnoni* was also recorded from the Masai Reserve on wild Rutaceae.

5. **Lampides boeticus.** L.,— The long-tailed Blue. Has on several occasions done considerable damage to field and garden peas, the caterpillars eating the foliage, boring into the pods and destroying the young peas: Kabete: Kyambu: Limuru.

6. **Metarctia rubipuncta.** Hamp.

Caterpillar common on sweet potatoes in the Kikuyu Reserve: as the sweet potato is here practically a perennial, crop there is always a food supply and continuous broods throughout the year; pupa in the soil below fallen leaves or just below the surface of the soil, glossy black in colour; not a serious pest though sometimes much of the foliage is eaten: widely distributed throughout native cultivation: not as yet recorded from the Coast districts: caterpillar parasitised by *Dejeana hecate.* Karsch, and *Sturmia atropivora*, R. D. Kabete; Kyambu: Kikuyu: Fort Hall: Nyeri: Masai Reserve: Kavirondo.

7. **Diacrisia investigatorum,** Karsch.,—The Woolly Bear. Caterpillar large, hairy, black: found on a variety of garden and field plants, vegetables, and weeds of diverse Natural Orders: Roses: Apple: Plum: Tobacco: Sweet Potato: Cabbage: Solanum sp: Grasses. Caterpillar seems to be somewhat resistant to ordinary strengths of sprays: hand picking best method of control in gardens and orchards; wide distribution: Nairobi, Kabete, Lumbwa, Nakuru, Kavirondo.

8. **Chloridea obsoleta.** F.— A major pest: one of the commonest injurious caterpillars of the Protectorate: is to be found wherever there is cultivation from the Coast to the Lake; both moths and caterpillars vary much in size and markings.

Boll Worm of Cotton—on leaves and buds and eating into the bolls: on the Coast, Malindi, and Tana River: from Kibos, 6 miles from the Lake.

Cob Worm of Maize—eating the developing cobs: Coast: Nairobi, Kabete, Nakuru, Limuru, Kavirondo.

Tomato Worm—eating the leaves and boring into the fruit; Nairobi, Kabete, Njoro.

Bud Worm of Tobacco—eating the leaves and boring into the developing seed capsules: Kabete, Njoro.

On Peas—boring into the pods and eating the young seed: Kabete, Limuru, Kikuyu.

On Linseed—eating into the seed capsules: considerable damage was done to the crop at Njoro and Kabete.

9. **Euxoa segetum,** *Schiff.*—The Commonest cutworm of the Protectorate: has been responsible for the loss of thousands of young freshly planted out coffee bushes: the caterpillars feed at night ringing the bark about the soil level; during the day they are to be found hiding in the soil at the base of the bush; poisoned baits were used with success but the method which has been

found to answer best of all is to have a gang of several "totos" continually going round and grubbing up the caterpillars with a stick and collecting them into a tin which has some water and oil in it. They have a large variety of food-plants—coffee, maize, potatoes, beans, peas, tobacco, cabbage, etc., tomatoes, garden plants. They are particularly abundant on fallow lands which have not been kept clean as there is a plentiful food supply in the shape of weeds of all kinds.

10. **Euxoa spinifera,** Hubn.—Has much the same food plants as *segetum*, but is not so common: to be found all the year round and sometimes in great numbers; has also been found feeding on grass.

11. **Polia inferior,** Guen.—Caterpillars were reported to have been found climbing the young coffee bushes and eating the bark; in one instance the primaries were ringed and died back: Kabete, Kericho.

12. **Laphygma exempta,** Walk.—The Army Worm. Appearing in countless myriads and eating grasses, wheat, and maize: Fort Hall Road, Nairobi, Kikuyu Reserve.

13. **Prodenia litura,** F.—Caterpillars eating the leaves and boring into the tubers of Potatoes, Mangles and Sugar Beet at Kabete 1914.

14. **Spodoptera mauritia,** Boisd.—Caterpillars usually found on grasses and weeds : at Kabete found eating Maize, Oats, and Sugar Cane.

15. **Grammodes geometrica,** F.—Caterpillars on a variety of garden plants : Nairobi, Kabete, Nakuru,

16. **Plusia orichalcea,** F.—In 1911 the caterpillars of this moth did considerable damage to potato tubers at Kabete. The moth is easily distinguished by the large golden or brassy patch on the fore wings: commonly found on rape and other Crucifers.

17. **Cosmophila erosa,** Hubn.—Caterpillars on Cotton: Malindi 1909, Kabete 1912, Mumias 1910.

18. **Earias insulana,**—Boisd. Not common but has been recorded several times from Cotton on the Coast and was found on a wild Hibiscus at Kabete.

19. **Orgyia vetusta,**—Hamp., var. Caterpillars on Quince and Apple at Kabete 1914.

20. **Porthesia Producta,** Wlk.—Common on castor-oil in all native shambas: young trees sometimes completely defoliated: larvae seem to be more or less omnivorous.

21. **Naroma signifera.**—Wlk. The Fig Moth. Common on cultivated figs all over the Protectorate when in numbers the young growth is destroyed: the native food plant seems to be *Ficus religiosa.*

22. **Hippotion celerio,** L.—The Silver-striped Hawk. Caterpillars very destructive to vines: may be green or dark brown, both occurring on the same plant: the pupae are found below fallen vine leaves: Kabete, Kedong Valley. Also on Sugar Beet at Kabete 1915.

23. **Herse convolvuli,** L.—The Sweet-Potato Hawk. A common, large, grey moth with pink bands on the abdomen: the caterpillars are sometimes found in great numbers and defoliate considerable areas of the sweet potato in native cultivation: found also on tobacco and sunflowers: widely distributed.

24. **Nudaurelia sp.** (unnamed in the B.M.)—Black, yellow spotted caterpillar with reddish brown spines: destructive to Pepper, Gums, Roses, Apple, Apricot; and has been recorded once from Nairobi, from Coffee.

25. **Duomitus capensis,** Wlk.—The Goat Moth of Cassia and Wattle.

First recorded as doing damage to Cassia and Wattle at Njoro in 1913: since then has been found in castor-oil: common in native plantations: Njoro, Kabete, Kyambu.

26. **Metanastria distinguenda,** Auriv.—Caterpillars destructive to Wattle and Quince: often in great numbers, gregarious: Nairobi, Kabete.

27. **Parasa sp.**—To be found wherever coffee is grown in the Protectorate: when the caterpillars are numerous much damage is done: always to be found on the under surface of the leaf: pupae attached to the bark of the stem, same colour as the bark: Nairobi, Kabete, Limuru, Kyambu, Nakuru, Kericho, etc.

28. **Argyroploce leucotreta,** Meyr.—The Citrus Moth. The most serious pest so far met with on Citrus: all varieties of orange and naartje are attacked: eggs laid singly on the fruit, the minute white caterpillar bores into the orange and the attacked fruit falls prematurely (see Report 1913-14); has a much wider distribution than was known last year; has been recorded from Lukenia and the Mua Hills, Thika and Rueru: though it caused considerable loss in the orchard at Kabete last year, this season the trees are clear of it, none having been found for months.

29. **Thliptoceras Octoguttalis,** Feld.—The Coffee Berry Moth.

Common in Coffee plantations: caterpillars bore into the green berries: when crop is harvested the ends of the twigs are destroyed: caterpillar pupates between the berries which it binds together with threads of silk, sometimes between the leaves; not as yet a serious pest.

30. **Gelechia gossypiella,** Saund.—The Pink Boll-Worm. Serious pest on cotton: eggs laid singly on leaves and sepals: caterpillars at first eat the leaves or epidermis of the boll and later bore into the boll and feed on the seeds: pupation in seeds

31. **Phthorimaea operculella,** Zell.—The Potato Moth. The Split Worn of Tobacco.

The Larva mines in the leaves of the plant, bores into stem and tubers: stored tubers often badly attacked: bores in the leaves (usually the lower leaves) of tobacco causing small blotches: one caterpillar may be responsible for several blotches: common to find dozens of these caterpillars hanging down by silken threads from the leaves in a barn where tobacco is air cured: the moths are also common in such a barn,

32. **Sitotroga cerealella,** Ol.—The Grain Moth. The adult moth is small and buff-coloured and was common at Kabete last harvest time: damage is done by the grubs to the cobs in the field and when the grain is harvested and stored the moths emerge by small round holes through the harder outer surface of the kernels: has a wide distribution in the Protectorate: Kavirondo. Kisii, Nakuru, Nairobi, Kabete, Mombasa,Tana River.

33. **Cemiostoma coffeellum,** Staint.—The Coffee Leaf Miner Moth.

Found in most coffee plantations: the whitish caterpillar is about 4-5 mm. long and feeds under the epidermis of the leaf causing the well known brown patch: pupates under the brown patch: the moth is small and glittering with dark marks on the fore wings: number of generations not yet determined.

34. **Plutella maculipennis,** Curtis.—The Diamond-back Moth. Common on cruciferous crops in the hotter and drier weather; cold and rain affect the caterpillar adversely.

35. **Schizonycha kolbei, Brenske.**
36. **Schizonycha sp.**
37. **Camenta sp.**
38. **Trochalus sp.**
39. **Serica sp.**

Common all the year round in the nursery and orchard at Kabete. The grubs live at the base of the plant and feed on the roots: the adult beetles feed on the foliage of a great variety of plants and trees.

40. **Anomala kersteni,** Gerst.—The adult beetles completely defoliated the vines at Kabete: has also been reported from the Kedong Valley and from Nairobi as destructive to vines.

41. **Adoretus punctipennis,** Fahr.—Feeds on the leaves of vine, apple, pear: Kabete, Nairobi, Ulu, Laikipia.

42. **Oryctes monoceros,** Ol.—The Coconut Beetle. The worst enemy of Coconuts on the Coast Lands: has been taken from Dum Palms, Borasses Palms, Ceara Rubber (Mazeras). Dr. Aders reports it from Sugar Cane in Zanzibar.

43. **Oryctes boas,** F.—Several specimens were taken from the coconut beetle traps but it has not been found in the palms: common in the Kikuyu Reserve breeding in the thatch of native huts.

44. **Elaphinis adsperula,** Gerst.—Was first recorded as doing damage in 1909, at Limoru, by eating the leaves and flowers of the Plum. The Coffee Plant Inspector has forwarded specimens from Kyambu with a note to the effect that the flowers and leaves of Coffee were eaten. It is commonly found on flowers of the Rose, Dahlia, and on the Coast on the Mango.

45. **Rhabdotis virginea,** Klug.—Very destructive to garden flowers: Kikuyu, Machakos. Kabete, Limoru, Nairobi, Lumbwa.

46. **Pachnoda sinuata,** F.—Destructive to flowers of Citrus, Coffee, Mango, Roses.

47. **Diplognatha silicea,** MacL.—The Black Rose Chafer. Has a wide distribution and has been reported as injurious to the flowers of Cotton (Malindi 1909). Citrus (Limoru 1912), and to garden flowers generally.

48. **Oxythrea elegans** Klbe.—Eating flowers of Rose, Coffee, Citrus, etc. Kabete, Limoru, Machakos, Lukenia.

49. **Scarites taciturnus,** Chd.—

50. **Carabomorphus brachycerus,** Gerst.—Were both found feeding on *Gonocephalum simplex*, at Njoro 1910-11, when the wheat was attacked by the plague of these beetles.

51. **Laemophloeus minutus,** Ol.—Destructive to stored grain.

52. **Epilachna hirta,** Thb.—and 53. *Epilachna similis*, Thb. Are both common in grass lands: the epidermis is eaten from the leaves of grasses, maize, wheat, and the plants present a bleached appearance. In one season much of the maize crop in the Kikuyu Reserve was almost completely destroyed.

54. **Epilachna chrysomelina,** F.—In both adult and larval stages is injurious to Cucurbitaceæ.

55. **Dermestes vulpinus,** F.—The Horn Beetle. Injurious to hides, skins, and heads of trophies.

56. **Apate monachus,** F.—Boring in branches of Coffee, Plum, Wattle, Grevillea Robusta. Has only been found in those Coffee plantations which are close to the forest: at present is not a serious pest on coffee and has been controlled by the injection of small quantities of carbon bisulphide.

57. **Bostrichoplites cylindricus,** Fahr.—Boring in dry bamboos used for building purposes: its presence is detected by the dust which drops from the holes made in the bamboo.

58. **Tetralobus flabellicornis,** L.—Several specimens were found in the coconut beetle traps at Changamwe: from coconut palm, Freretown (Sharpe).

59. **Phrynocolus crispatus,** Fairm.—

60. **Gonocephalum simplex,** F.—These two beetles were responsible for the destruction of the wheat at Njoro in 1910-11: since then *G. simplex* has been found by the Coffee Plant Inspector, in numbers, eating the leaves of coffee: it has also done considerable damage to tobacco in the seed beds and immediately after planting out: the young plants are attacked either just at the soil level or a little lower: the stems are gnawed and the plants finally succumb: older plants are sometimes attacked in the same way: the beetles have been found climbing the plants and gnawing the leaves: Njoro (wheat), Nyeri and Songhor (coffee), Kabete and Njoro (tobacco).

61. **Lagria villosa,** F.—Eating the leaves of wattle: Kericho, Mumias, Limoru.

62. **Epicauta nyassensis,** Haag.—A swarm of these beetles completely defoliated a field of potatoes on the Plains near Nairobi: reported from the shamba at the Mara River Post.

63. **Mylabris praestans,** Gerst.—On garden flowers, Nairobi, Mara River.

64. **Mylabris amplectens,** Gerst.—On Doliches lablab (Kikuyu), on sweet potato (Kabete), on wild Ipomea.

65. **Mylabris apicalis,** Guer.—On cotton, Malindi 1909; Mumias 1910.

66. **Mylabris sjostedti,** Borch.—On beans, Kericho 1914 (Deakin).

67. **Bruchus chinensis,** L.—Common in every shop in the Bazaar where beans, peas, kunde, etc., are sold: has a wide distribution in the Protectorate: destructive to stored pulse.

68. **Syagrus puncticollis,** Lef.—Beetle black to blackish brown with finely punctured elytra: feet covered with greyish brown hair: from Cotton, Belazoni, Tana River.

69. **Ceralces ferrugineus,** Gerst.—On flowers, Nairobi, Kabete, Kericho.

70. **Idacantha magna,** Weise.—Eating young coffee berries and leaves.

71. **Ootheca bennigseni,** Wse.—On beans and sim-sim.

72. **Megalognatha imbecilla,**—Wse; and M. metallica, Jac. On Wattle, Kericho, Kabete: on plum Kericho, Lumbwa.

73. **Monolepta leuce,** Wse.—Appearing in vast swarms: strip the epidermis from the leaves of all sorts of vegetation; in

the Arboretum, Nairobi, one swarm completely destroyed some ornamental shrubs and trees; destructive to citrus at Kabete 1911.

74. **Monolepta nigrisuturalis,** Jac.—Much smaller than the above; does the same sort of damage.

75. **Mallodon downesi,** Hope.—Was first recorded in 1908 boring in an Acacia: the tree was blown down during a storm and both larvae and adults were found in the burrows. It has several times been found in the coconut beetle traps: found by Mr. Sharpe last year in a palm at Frere town.

76. **Anthores leuconotus,** Pascoe.—In 1877 was recorded by Kirk as an enemy to Coffee in Zanzibar. Since 1894 it has been a serious pest in G. E. A. Up to the present it has been found in one locality only in the Protectorate—at the Bura Mission, about 25 miles from Voi on the Voi-Taveta road. This locality is isolated as no coffee is grown in the near neighbourhood and precautions have been taken to prevent the spread of the pest. The eggs are laid on the stem or on the roots at or just below soil level. The young larva lives for quite a time on the bark, eating the tissue in the neighbourhood of the cambium. Sometimes it works straight upwards, at other times a considerable area of the bark is eaten, while again the stem may be completely ringed. When this is the case the tree quickly succumbs. After feeding on the bark, the larva bores into the stem, more or less completely tunnelling it. The stem or branch is sometimes so weakened that it is blown over by the wind.

77. **Coptops aedificator,** F.—Very destructive to Ceara Rubber at Miritini and Kipingoni, some trees being so destroyed that they could be broken across by hand: has been found in Coffee in G. E. A.

78. **Phryneta apinator,** F.—The Fig Tree Borer. Was first found boring in Figs, Parklands, 1909: since then has been recorded from Kabete, Ulu, Limoru, Njoro, Nakuru. The adult beetles live on the bark and sometimes the leaves. The grubs bore in the stems and branches. Its presence is easily detected by the light coloured frass found at the base of the tree or just below the branch in which the grub is working.

79. **Ceroplesis conradti,** Klbe.—Boring in ornamental trees, Nairobi.

80. **Dirphya sp.**—Was found for the first time at Marambu on the Ruiru, this year. On this plantation some thirty to forty trees were found to be attacked. No adults have yet been hatched so that it is not possible to name the species. It may turn out to be the same as the Yellow-headed Coffee Borer

of Uganda—*Dirphya princeps*, Jord.—or the 'Orangegleber Kaffeebohrer.' *Dirphya usambica* Klbe., of G. E. A. Mr. Goldsworthy is carrying out some experiments with Carbon bisulphide.

81. **Systates cribripennis,** Fairm.— A leaf eating weevil, destructive to the foliage of coffee, citrus, pear, apple, plum: Kabete, Nairobi, Ulu, Njoro, Kericho.

82. **Cylas formicarius,** F.—The Sweet Potato Weevil. This weevil has a very wide distribution in the World being recorded from China, India, Ceylon, Madagascar, Zanzibar, Uganda, West Indies, North and South America. British Guiana, Hawaii, Tonga Islands. As yet it is not a serious pest in the Protectorate though it is common in some districts. According to Dr. Aders, in Zanzibar, large numbers are found throughout the year. The eggs are laid on the tubers and on hatching the larvae at once tunnel into the potato. The life cycle takes 24-30 days and there are many generations during the year.

83. **Cryptorrhynchus mangiferae,** F.—The Mango Weevil. In B. E. A. this weevil was first noticed in a heap of mango kernels at Changamwe in 1909. The beetles were hiding amongst and below the kernels. The eggs are laid on the young fruit and the grub on hatching bores its way through the pulp to the Kernel where it pupates. In many instances it was not possible, in the ripe fruit, to trace the grub although it was to be found in the Kernel. In other cases the fruit was so damaged as to be unfit for food. This was evidently due to the fact that the pupa had hatched in the kernel and the beetle had made its way to the outside. It is to be found wherever mangos are grown on the Coast.

84 **Rhynchophorus phoenicis,** F.—The African Palm Weevil. In other parts of the World an allied species has been responsible for considerable damage to coconut palms. Although many hundreds of dead and dying coconut palms have been cut and destroyed, in no instance has either the weevil or the grub been found. As far as I know, the only record is from an ornamental palm at Freretown, when the specimens were forwarded by Mr. Sharpe (1914).

85. **Calandra granaria,** L.—Very like 86 but without the markings and the adult is unable to fly. Infests stored grain, maize, wheat, barley, oats.

86. **Calandra oryzal,** L.—A dark brown, small weevil (4 mm.), with four lighter, reddish spots on the wing covers: the adult can fly: found in stored maize, wheat, barley, flour. In one instance it was found on maize cobs in the field.

87. **Nezara viridula**, L.—Was abundant last year on potatoes: has also been sent to the Lab. as injurious to coffee: I have never seen it in such numbers as to constitute a serious pest.

88. **Bagrada picta,** F.—An enemy to all cultivated Cruciferae: has been recorded several times from coffee: its commonest native food plant is *Diplotaxis inopinata.*

89. **Antestia variegata**, Thb.—*lineaticollis.* St., The Coffee Bug.

A major pest on coffee: the eggs, 9-13 in number, are laid on the under surface of the leaves, on dead leaves below the trees, on the berries and on the stem: the greatest number of eggs laid by any one bug was 38: the bugs suck the juices from the green berries, the berry becomes black, does not develop and in many instances drops off: when green berries are not present the bugs attack the buds with the result that the flowers do not develop and the branches become covered with numerous adventitious shoots and leaves which makes pruning more difficult and costly. The bugs are not fond of shade and very few are to be found on well shaded bushes. Other plants on which this bug has been found are peaches, apples, plums, maize, wimbi, and matama.

90. **Agonoscelis puberula.**—Stal., and 91. *Agonoscelis versicolor*, F.

A plague of these bugs did considerable damage to maize by sucking the juices from the developing heads. They were also abundant on Linseed sucking the juices from the developing capsules: Kabete, Njoro.

92. **Calidea apicalis**, Sch.—Was forwarded from cotton, Tana River—not known to be a serious pest.

93. **Sphaerocoris annulatus,** F.—var., *ocellatus*, Klug. Common all over the Protectorate on native vegetation ; has been found in most coffee and citrus plantations but is not considered to be a serious pest.

94. **Oxycarenus hyalinipennis** Costa.—From cotton bolls Kabete, Malindi, Tana River.

95. **Dysdercus superstitosus,** F.—Cotton lint stained with the excrement ; found also in great numbers on wild Hibiscus and on the Baobab.

96. **Dyadercus nigrofasciatus,** St.—Forwarded from Belazoni as staining the lint of Cotton.

97. **Leptoglossus membranaceus,** F.—Puncturing the fruits of vegetable marrows and cucumbers, also on plums and oranges. The pierced fruit falls off prematurely.

98. **Pachytilus sulcicollis,** Stal.—The South African Migratory Locust. One small swarm only has been reported in the Trans Nzoia district. No particulars were given as to direction of flight, etc.

99. **Chrotogonus hemipterus,** Scham.—A flattened, earth-coloured surface grasshopper, common in gardens feeding on seedling plants, young vegetables, tobacco seed beds. Found all the year round.

100. **Zonocerus elegans,** Thb, and *Zonocerus variegatus*, L.—Injurious to vegetables in gardens: appeared in numbers on coffee and did considerable damage by defoliating the bushes: usually found singly and not in swarms.

102. **Phymateus viridipes,** Stal.— Found singly in nearly every coffee plantation and has been called "the coffee locust." They feed on the leaves but have not been responsible for much damage.

103. **Acridium aeruginosum,** Burm.—(Cyrtacanthacris renacea, St.)

Nymphs green, adult reddish with a yellow stripe from behind the head to the tegmina: is the common large grasshopper found in fields and gardens all over the Protectorate: there seem to be continuous broods throughout the year: it is non-migratory.

104. **Schistocera peregrina,** Ol.—The Migratory Locust. Several swarms were reported during the year and records are being kept: there is no record of egg-laying.

105. **Schistocera tartarica,** L.—Several swarms reported from the Kericho district: Mr. Orchardson, whose farm is five miles from Kericho on the Lumbwa Road, reports as follows:—'A large but scattered swarm, flying low and settling but, in general, making for Fort Ternan or Muhoroni, extending to East and West about two miles. Not eating much but young vegetables, not having touched young maize'. Although swarms were reported from different parts of the Kisumu Province not much damage has been done except to grass lands. Over fifty reports have been sent in but it is difficult to tell exactly where the swarms originated and what finally happened to them. More information is necessary before any conclusions can be drawn.

106. **Brachytrypes membranaceus,** Drur.— Not present in any great numbers: has been several times sent in as injurious to garden vegetables and young plants.

107. **Athalia sp.**—Very destructive to Crucifers, especially to turnips and radishes: Nairobi, Kabete, Nakuru, Mara River; native food plant is *Diplotaxis inopinata.*

108. **Xylocopa flavorufa,** Geer. and 109. *X. nigrita.* F.—Fencing posts, rafters, and woodwork of buildings and stables are attacked and more or less tunnelled and destroyed.

110. **Trioza sp.** The Citrus Psylla.—This pest is very common wherever citrus is grown in the Protectorate and all varieties are affected. The small eggs, orange yellow in colour

are deposited on the young growth either along the sides of the leaves or all over the leaves, and young stems. When the eggs hatch the young crawl to the underside of the leaves, and where one settles a little pit is formed which gives to the leaf the characteristic crinkled appearance. When lying in the depression, attached to the leaf by the proboscis, the larvae are very like scales in appearance with a fringe of waxy, white filaments. From these hatch the winged adults which resemble aphids. Young nursery stock is usually badly attacked and the young plants rendered unsightly.

111. **Macrosiphum lycopersicella,** Theo.—Food-plants: Cape Tomato, Rape. Locality: Njoro.

112. **Macrosiphum antirrhinum,** Macchiate.—Food plants: Antirrhinum sp. Locality: Njoro, Kabete.

113. **Macrosiphum granarium,** Kirby.—Food-plants Broom Corn, Wheat, Barley. Locality: Njoro, Kabete.

114. **Aphis brassicae,** L.—The Cabbage Aphis. Food-plants: Cabbage, Rape, Turnip, Radish. Locality: Nairobi, Kabete, Nakuru.

115. **Aphis gossypii,** Glover.—The Cotton and Melon Aphis. Food-plants: Cotton, Cucumbers. Locality: Njoro, Kabete Malindi, Mombasa.

116. **Aphis tavaresi,** Del Guer.—The Black Citrus Aphis. Food-plants: Citrus, all varieties. Locality: Wherever Citrus is grown.

117. **Aphis rumicis,** L.—Food-plants: Beans, Peas. Locality: Kabete.

118. **Aphis africana,** Theo.—Food-plants: Broom Corn, Barley. Locality: Njoro, Kabete.

119. **Toxoptera aurantii,** Boyer.—Food-plants ; Citrus Locality : Kabete, Ulu, Nakuru.

120. **Toxoptera graminum,** Rond.—Food-plants: Broom Corn, Wheat, Barley. Locality : Kabete, Njoro, Limoru.

121. **Eriosoma lanigera,** Hans.—The Woolly Aphis. Food-plants : Apple. Locality : Kabete, Ngelani, Nairobi.

122. **Chrysomphalus aurantii,** Mask.—The Citrus Red Scale. Food-plants : Citrus, Roses, Guava, Loquat. Locality : Kabete, Njoro, Kyambu, Limoru, Nairobi. When this scale is present in large numbers the leaves turn yellow and drop off shoots die back and in some cases the tree is killed: the scale increases rapidly and is not an easy one to get rid of: at present it is only on isolated trees and precautions have been taken to prevent its spread.

123. **Mytilaspis beckii,** Neum.—(Lepidosaphes beckii, Neum.), Mussel Scale. Food-plants : Citrus. Locality : Mombasa, Mazeras, Changamwe. Dark brown or purplish in colour, slightly curved, like a mussel shell in shape, mostly found on leaves and fruit. Common on wild varieties of citrus on the Coast, on oranges imported from Zanzibar.

124 **Ceroplastes ceriferus,** And.—Food-plants : Coffee. Locality : Kabete, Nairobi, Thika River.

125. **Lecanium africanum, Newst.,** The Green Scale of Coffee.—Food-plants: Coffee. Locality: Most Coffee plantations.

126. **Lecanium hemisphaericum,** Targ:—Food-plants: Coffee, Citrus. Locality : Kabete, Kikuyu, Kyambu, Ngong.

127. **Lecanium nigrum,** Niet.—Food-plants : Coffee. Locality : Ruiru, Thika, Kabete, Nairobi, Ngong.

128. **Pulvinaria psidii,** Mask.—The Green Mealy Scale. Food-plants : Coffee, Guava, Loquat. Locality : Nairobi, Kyambu, Ruiru, Thika, Kericho.

129 **Icerya purchasi,** Mask.—The Cottony Cushion Scale. Food-plants : Coffee, Citrus, Wattle, Pittosporium. Locality: Nairobi, Kabete, Ruiru, Nakuru.

I have the honour to be,

Sir,

Your obedient servant,

(*Signed.*) THOS. J. ANDERSON,

Entomologist.

ANNUAL REPORT

OF THE

PLANT IMPORT INSPECTOR

FOR THE

YEAR ENDING 31st MARCH, 1915.

DEPARTMENT OF AGRICULTURE,
MOMBASA,
29th April, 1915.

THE ENTOMOLOGIST,
DEPARTMENT OF AGRICULTURE,
NAIROBI.

Sir,

I have the honour to submit my annual report for the year ending March 31st, 1915.

Inspection of Seed and Plant Imports.

Consignments to the number of 786 and valued at Rs. 43,662 were passed for entry into the Protectorate, these imports being fumigated when it was considered necessary.

Consignments.	Description.	Value in Rupees.
180	Farm Seed	7,184
218	Garden Seed	5,661
65	Tree Seed	938
206	Fruit Trees	27,820
50	Ornamental Trees	1,093
58	Veg. and Orn. Plants... ...	831
9	Roasted Coffee	135
786	Total ...	43,662

The number of consignments of plants confiscated was 11, valued at Rs.116 : they consisted of Coffee seed, Seed Potatoes, and Peachstones.

In transit for the Belgian Congo, Uganda, and German East Africa, 46 packages valued at Rs. 1,192 were passed.

The number of consignments fumigated was 31, these being chiefly Apple trees and stocks from England for woolly Aphis; Citrus from Australia for Scale Insects and Ornamental Plants from India, Zanzibar, and England, for Mealy Bug and Aphides.

As in previous years the chief imports have been in Citrus from South Africa and Australia: these are closely followed by deciduous fruit trees and farm seeds from various places.

Vanilla was also imported in quantity from the Seyschelle Islands, but this, I am told, has nearly all died, more, I understand, is to be imported.

Altogether, judging by the first three months of the financial year, the imports would have far exceeded those of previous years; and even after the war commenced, except for the months of December and February, they have been quite good. The uncertainty of the arrival of ships and delay in transport has caused several consignments to arrive in a dead or dying condition.

When the Chief of the Economic Plants Division went on leave I was instructed to take over the management of the Government Farm at Mazeras, which has entailed much extra work for me.

On the outbreak of War I volunteered my services, and for about a month, until I was ordered back to work by the Director of Agriculture, I was unable to attend Office for more than a few minutes daily : after that time I still continued night patrol work for the Marine Defence, but it became so inconvenient as my ordinary work resumed its normal course that I resigned from that work in November.

The Coconut Beetle traps were again opened, commencing at Changamwe on October 26th: the work lasted until January 22nd. I visited the traps to inspect the work when the men were opening them at various places: the contents were sent to me to be counted, and the returns submitted to you weekly.

Two specimens of the Acacia borer (Mallodon downesi) were found in the traps and sent you for identification ; also Palm weevils were found at Freretown and sent you and were found to be Rhynchophorus signaticollis, they destroyed a fine specimen of the Palm, Phœnix Canariensis: Coconut Beetle grubs were found at Mazeras on two occasions in old Ceara Rubber stumps.

Maize Exports.—The Maize crop was, I believe, a good one, but the export was only 1,365 tons, the Maize having been used for local consumption and kept in the country by the Military.

The Maize that did come down for export was fairly good and free from weevil, for only 90 tons were fumigated; but one consignment of 120 tons was so bad that I refused to fumigate and pass it as fit for export, and it was ground into flour and sold locally.

During the months of May, June, and July, 35 certificates were given for 890 bags of potatoes, certifying them free from Black Scab (Synchytrium endobioticum) for export to Tanga and Dar-es-salaam.

Enclosed herewith are the tables of Maize Exports, and Seed and Plant Imports, during the year April 1914—March 1915.

I have the honour to be,
Sir,
Your obedient servant,

(*Signed*) H. B. SHARPE,
Plant Import Inspector.

Maize Exports from April 1st, 1914, to March 31st, 1915.

Date.	England.	France.	Germany.	Zanzibar.	Belgium.	Total.
1914.						
April	...	...	...	...	...	...
May	...	...	...	...	...	...
June...	...	...	...	...	...	...
July...	200	...	120	...	30	350
August	240	40	...	...	...	280
September	160	110	...	10	...	280
October	140	60	...	20	...	220
November	...	...	...	...	...	...
December	165	20	...	...	...	185
1915.						
January	...	...	...	...	...	...
February	50	...	...	...	...	50
March	...	...	...	...	...	...
			120	30	30	1,365 tons.

Plant and Seed Imports from April 1st, 1914 to March 31st, 1915.

Date.	Farm Seeds.		Garden Seeds.		Tree Seeds.		Fruit Trees.		Vegetable and Ornamental Plants.		Ornamental Trees.		Roasted Coffee.		TOTAL.	
	No.	Rs.	No.	Rs.	No.	Rs.	No.	Rs.	No.	Rs.	No.	Rs.	No.	Rs.	No.	Rs.
1914.																
April ...	13	684	33	487	13	137	57	1,633	4	68	7	415	...	...	127	3,424
May ...	8	1,362	19	224	12	240	2	125	5	125	6	48	...	...	52	2,124
June ...	20	1,308	37	705	8	194	2	60	12	155	4	50	...	...	83	2,472
July ...	26	636	20	200	6	105	34	8,598	...	...	1	75	...	...	87	9,614
August ...	...	...	14	501	3	15	5	585	...	...	8	125	6	60	36	1,286
September ...	3	44	7	113	3	39	58	11,125	2	40	2	25	...	...	75	11,386
October ...	19	430	12	82	6	75	13	2,690	4	28	...	...	...	...	54	3,305
November ...	61	1,140	6	151	1	5	1	145	1	5	...	...	3	75	73	1,521
December ...	2	12	5	136	7	95	2	150	3	110	5	60	...	...	24	563
1915.																
January ...	5	25	42	2,608	1	5	12	326	13	121	7	123	...	...	80	3,208
February ...	3	265	4	9	...	...	...	...	9	55	1	30	...	...	17	359
March ...	20	1,278	19	445	5	28	20	2,383	5	124	9	142	...	...	78	4,400
TOTALS ...	180	7,184	218	5,661	65	938	206	27,820	58	831	50	1,093	9	135	786	43,662

ANNUAL REPORT

OF THE

GOVERNMENT STOCK FARM, NAIVASHA

FOR THE

YEAR ENDING 31st MARCH, 1915.

NAIVASHA,
31st May, 1915.

To THE HONOURABLE
THE DIRECTOR OF AGRICULTURE,
NAIROBI.

Sir,

I have the honour to submit my report for the year ending 31st March, 1915.

The Rainfall during the year was as follows:—

April	1914	1.90	inches.
May	,,	5.56	,,
June	,,	1.43	,,
July	,,	3.68	,,
August	,,	3.04	,,
September	,,	.65	,,
October	,,	1.05	,,
November	,,	2.78	,,
December	,,	.07	,,
January	1915	.54	,,
February	,,	.37	,,
March	,,	1.70	,,
	Total	22.77	,,

The above rainfall suited the sheep and at the same time grew enough grass to keep the cattle and other stock in good order through the year.

During the year cattle did exceedingly well and the death rate was very low; out of a mob of about 290 cattle of pure and grades we lost three; one imported bull from spinal meningitis, one little calf with white scour and one young 3rd cross Hereford calf with marginal points.

The pure-bred Shorthorns have done well. The Lincoln Red Shorthorns giving a larger return of calves than the beef breeds. For some reason there appears to be a tendency in the beef Shorthorns to go barren if by chance they happen to abort and in any case it takes a long time before they get in calf again, otherwise they do well. The Friesland cattle have continued to be a success and are good milkers and breeders. The pure-bred Herefords as mentioned in previous reports have not come up to anticipations and the increase has been disappointing. The Ayrshire cattle have done exceedingly well and the increase has been splendid the only other breeds to compare with them on this farm have been the Friesland and the Lincoln Shorthorns, but the Ayrshire and Friesland must be placed first in order of merit. The pure-bred Guernsey cattle did well and the Guernsey Shorthorn crosses also and they are good milkers.

Grade Cattle :—The grade Shorthorns crossed with Native cattle gave satisfactory results, 1st, 2nd, 3rd and 4th crosses are nice cattle, good milkers and show no sign of deterioration. The grade cattle known here as the Guernsey Shorthorn grade which is Native, Guernsey, Shorthorn, Shorthorn are exceedingly nice cattle; being good milkers they are worthy of notice for dairy farming. I have previously mentioned these cattle as most promising and I am still of the same opinion. The Friesland grades have been bred from imported Cape Colony grade cows and are of excellent quality. Hereford grade cattle are doing better than formerly. We have splendid 2nd, 3rd and 4th crosses in this breed but many are very poor milkers, some can hardly rear their calves. The figures of this breed have not shown the practical return of the other breeds. I am of opinion that where dips are used Herefords both pure and grades will do much better than they have done in previous years as there is no doubt they have suffered more from tick diseases than the other breeds on this farm. The Ayrshire grades have certainly done well in every respect and they grade up in a very satisfactory manner with the native stock.

Heifers in many countries are put to the bull about two years old with good results. I am, however, of the opinion that in many parts of this country heifers are apt to get too fat if left till two years old or two and a half before they are put to the bull and in consequence become very slow breeders or barren. I consider that all heifers in this Protectorate should be put to the bull at from sixteen to eighteen months old, as I feel certain from experience that this is the best course instead of my old custom of two years and two and a half years old.

I find high bred cattle are more subject to slow breeding and barrenness than others.

The Department has made a valuable importation of Friesland and Shorthorn cattle from South Africa. The Honourable the Director of Agriculture purchased twenty Friesland heifers and eight Friesland bulls, also fourteen head of Shorthorn cattle which come from Scotland to South Africa.

We stopped dipping our cattle some considerable time before the annual sale as some settlers had no dips and they were of opinion that if we dipped the cattle purchased by them they would die from diseases caused by ticks, as by dipping we would have broken down any immunity they had to tick diseases.

Sheep. The sheep on the farm are as follows:—Pure Merino rams and ewes; Grade Merino, that is those graded up from the Native sheep, we have up to the 6th cross. We also have first cross Lincoln on Native and then Merino on each successive cross up to the 6th cross. There are Welsh on Native and then Merino on each cross up to the 6th cross. Also a cross of Suffolk on Shropshire on the Native and then Merino on each cross. Next a grade of Suffolk and Shropshire on the Native as a first cross and then Suffolk on each successive cross. These are very fine sheep for a butcher and have a good paying coarse wool but are not so hardy as the Merino grade on the Lincoln Merino grade. From the stud rams and ewes purchased from Messrs Faulkner and Sons, Bonake, we have bred exceedingly good rams of pure Bonake blood.

The sheep have done well during the year. The weight of fleece per animal is about the same as last year. The Agents in London state that the general quality of the Merino, the grade Merino and Lincoln grade Merino wools is good. The price obtained was 10½d. per pound for the whole of the Merino fleece wool and 10d. for the whole of the fleece clip of grade Merino and Lincoln grade Merino. These prices are exceedingly good as they comprise the whole of the fleece clip in the above breeds. The fleeces sent to the recent Tropical Agricultural Exhibition held in London at the start of the war were much admired. Some were valued at 14d. per pound and the grade wool was highly spoken of. As I have before stated I find the mutton crosses of Suffolk and Shropshire grades suffer more with worms than the Merino, Merino grade or the Lincoln Merino grades.

The dosing used by me for tape worms was Cooper's powder sheep dip and salt for big sheep, and Cooper's powder dip mixed with water for lambs. For wire worms we used Cooper's powder sheep dip and blue stone mixed in water and given in liquid form.

As regards dips for scab I think that Cooper's powder sheep dip as a first dip after shearing is good; but after the wool gets a little growth I found that it, together with sun and wind, appear to discolour the wool.

For the welfare of the flocks I believe in giving plenty of salt as a lick.

The death rate in a flock varying from 2,225 to 2,565 during the year was 150; most of the losses were young sheep and lambs. We also lost a few by theft and the attacks of wild animals.

From my inspections of the flocks I notice that the pure Merino is just as hardy as the grade sheep, and the pure Merino lambs are the same if not hardier than many of the grade lambs. The increase of lambs from both the pure bred and grade ewes is good.

Goats.—The Angora and grade Angora goats have done well on the farm and their increase is good. The price obtained for the mixed grade mohair in London is very satisfactory. The improvement in the Native goat by crossing with pure Angora is all that one could desire.

Donkeys.—The donkeys are quite satisfactory. Crossing the native donkey with the imported Catalonian jackass is a success and the higher crosses of this breed are giving very good promise. We have just imported another Catalonian jackass to mate with the grades of the one we had.

Ostriches.—These birds are doing well and although a great fall has taken place in the value of the feathers, the birds still pay their upkeep and it is our intention to continue with them. The ostriches imported from Madagascar have done well. One of the cock birds has been sent to Mr. C. Hill on Mr. Rainey's farm to mate with a couple of his best hen birds, we are to divide the increase equally.

Horses.—The Stallion Royal Fox has proved himself a good foal getter and his progeny are doing very well. He has now served about 220 mares or more in the Protectorate. We have also an Arab stallion for crossing with Native donkey mares.

Pigs.—The few that we have here are doing very well.

Sales.—The annual sale took place on the 12th of March 1915. A large number of buyers were present, the bidding was brisk and the prices obtained, considering the present times, were good.

3 Friesland Bulls sold from	£52-10 to £84-0
7 Shorthorn Bulls sold from	£31-10 to £87-3
4 Ayrshire Bulls sold from	£27-6 to £44-2
1 Hereford Bull sold at	£32-11
2 Shorthorn, Guernsey Crosses sold at	£32-12 and £37-16
3 Friesland grade bulls sold from	£21-1 to £22-0
1 Mixed Friesland Hereford grade sold at	£23-2

2 Third cross Hereford grade bulls sold at	£11-11 and £15-15
3 Second cross Shorthorn grade bulls sold from	£15-15 to £18-18
2 Second cross Ayrshire grade bulls sold at	£15-15 each
3 Third cross Guernsey Shorthorn grade bulls sold from	£28-7 to £31-10
2 Ayrshire Cows sold at	£26-5 and £31-10
1 Shorthorn heifer rather deformed sold at	£8-8
1 Shorthorn Guernsey cross heifer sold at	£26-6
1 Half bred Shorthorn cow sold at	£21-6-8
4 Second cross Shorthorn grade cows one with calf at foot sold from	£16-13-4to £23-13-4
2 Third cross Shorthorn grade cows sold at	£22 and £22-14
2 Half bred Ayrshire cows sold at	£15-16-8 and £22-14
3 Second cross Hereford cows, one with calf at foot sold from	£20-to £21-14
5 Half bred Catalonian young jackasses averaged	£12 each
100 Pure Merino Rams averaged £6 being the highest price and £2 being the lowest	£3-12 each
1 Suffolk Ram sold at	£4-6-8
34 Second and third cross mutton grade rams sold at an average of	£1-6
25 Cull Merino ewes off shears sold at	6s. 8d
Cull grade Merino ewes off shears sold from	8s. 2d to 14s. 4d
Pure Angora rams sold from	£1 to £1-8
Grade Angora ewes off shears sold from	8s. to 13s. 8d

General remarks.—The stock as a whole have done well during the year. They have not been pampered or kept in a way that any private individual could not do. All the pure bred cows and calves are grazed out all day and brought into five acre wire bomas at night without any feed or cover and this is done all the year round. No cow or calf is fed unless sick or very much run down. The bulls when young are herded together and grazed out the same as the cows, are under no cover at night and are not fed. At a later date the pure bred bulls are fed a little and put in yards at the main boma at nights, they continue to graze out all day. The stud bulls that I am using are always under cover at night and always get a certain amount of mealie meal and grass hay.

The sheep are out all day and at night they sleep in mobs in fifteen acre and five acre paddocks without any cover at all. They also lamb outside. The pure Merino rams I feed during the tupping season ; and if the grass goes off and the Merino rams appear not to be doing well, I give all the rams a little crushed maize every night and morning but this does not take place all the year round.

Cultivation.—The area of cultivation at the lake front has been very much increased during the year and it is hoped will in the future provide the necessary feed for the farm.

The Lister engine and mealie mill erected some time ago has been a saving and a great convenience.

During the year I visited the farms of the following breeders :—

Lord Delamere.
The Hon. G. Cole.
Mr. Seymour.
Mr. Chillingworth.
Messrs. Pollard and Clements.
Messrs. Holzapfiel and Gilroy.
Messrs. Taylor and Knight.
Capt. Fey.
Messrs. Attenborough, Dobbin, Strong and Barry.

I was much pleased with the stock I inspected and considered the herds to be doing well.

During the year the stockman went on leave and Mr. Simpson acted for a while and when he left for the front, Mr. Tomlinson took over the duties of stockman.

The present year has been very successful. Notwithstanding the increased number of stock the upkeep expense is less than formerly.

I have the honour to be,

Sir,

Your obedient servant,

(*Signed*) N. A. McGREGOR,

General Manager.

ANNUAL REPORT

OF THE

GENERAL MANAGER, NAIROBI EXPERIMENTAL FARM, KABETE

FOR THE YEAR, 1914-1915.

DEPARTMENT OF AGRICULTURE,
NAIROBI EXPERIMENTAL FARM,
KABETE.

June 1915.

TO THE HONOURABLE
THE DIRECTOR OF AGRICULTURE,
NAIROBI.

Sir,

I have the honour to submit the Seventh Annual Report upon this farm for the year ending 31st March 1915.

Weather.—The year under review was very similar to last and the rainfall very deficient, being in each case almost 20 inches under the average of the two preceding years. The shortage was most marked in the November rains, and the yield of produce from that season was very poor.

Table A. (Meteorological)

Latitude :—1° 14' 30·94" S; Longitude :—36° 43'31·78" E; Height above sea level:—6,000 feet.

Month.	Inches Rainfall.	Highest Rainfall.	Date of Highest Rainfall.	No. of Days with 0·01" or over.	Average Maximum Temperature.	Average Minimum Temperature.	Average Dry Bulb.	Average Wet Bulb.	Average Ground Thermometers.	
									4 ft.	1 ft.
1914.										
April	10·00	1·70	3rd.	15	74·8	55·5	64·5	60·8	71·2	71·5
May	7·18	2·90	5th.	21	70·9	56·1	62·2	59·1	71·0	68·5
June	0·47	0·24	10th.	6	71·9	51·8	60·9	57·4	70·4	69·5
July	0·81	0·26	14th.	8	69·1	49·8	58·0	55·0	69·7	65·9
August	2·91	1·07	23rd.	9	71·5	49·9	59·6	56·5	68·4	66·0
September ...	0·20	0·12	13th.	5	74·4	52·3	61·2	57·9	69·5	69·3
October	2·38	1·40	30th.	7	78·4	52·9	63·7	57·8	71·0	71·4
November... ...	6·80	2·46	22nd.	21	73·2	55·8	62·6	59·6	70·5	68·8
December... ...	1·05	0·50	31st.	5	75·1	53·8	64·4	58·9	70·2	70·4
1915.										
January	0·05	0·05	2nd.	1	78·1	51·1	64·1	58·4	70·8	70·9
February	2·23	2·07	8th.	2	81·2	51·2	68·9	58·5	72·5	73·1
March	3·54	1·00	28th.	12	80·1	55·8	66·8	60·5	74·1	73·8
	37·62	...	...	112	74·9	53·00	63·1	58·4	70·8	69·9

Table B. (Meteorological.)

	1909-1910	1910-1911	1911-1912	1912-1913	1913-1914	1914-1915
Rainfall	34·22"	31·67"	54·34"	51·17"	34·04"	37·62"
Number of days with rain	...	129	143	148	143	112
	November :—	May :—	February :—	April :—	March :—	April :—
Wettest Month, with Rainfall ...	7·99"	5·96"	13·90"	12·19"	9·09"	10·0"
Mean:—Dry Bulb	61·9	63·6	61·9	62·1	61·6	63·1
Mean:—Wet Bulb	56·7	56·3	56·8	57·6	56·9	58·4
Mean:—Maximum Thermometer ...	73·9	72·8	73·5	72·6	73·6	74·9
Mean:—Minimum Thermometer ...	51·8	50·1	51·6	51·7	52·5	53·0
Mean:—Ground Thermometer, 4 feet.	...	...	...	69·3	69·5	70·8
Mean:—Ground Thermometer, 1 foot.	...	...	...	68·3	68·5	69·9

These tables give an idea of the weather during the past year. The highest temperatures occurred in February when we had 85.5° on the 23rd and 85° on the 1st. On March 5th also we had 85°. The lowest temperatures were on July 9th and 10th and August 12th when 42° was registered. July was the coldest and February the hottest month. There were no violent storms this year to do damage to crops.

Coffee.—All the land carrying this crop was deeply trenched with forked jembies and the couch grass completely eradicated. The trees responded to this treatment wonderfully, were very healthy, and had all the appearance of having received an application of a quick acting fertilizer. The older trees gave a good yield. There are 72 trees under special experiment with artificial manure and a record is being kept of the date and amount of picking from each tree. These results may be published in part next year.

Fruit Orchard.—A full account of this department is appended in Mr. Adams' report.

Linseed.—This crop is dealt with in a report by Mr. Dedonckele and subjoined to this.

Lucerne.—A further area of this was sown in November. Advantage was taken of what rain there was early in the month and the young plants seem now to be established.

MAIZE VARIETY EXPERIMENTS.

First Season.—Area, 29 Acres.

Variety.	Planted.	Duration.	Harvested.	Yield per Acre.
Ladysmith White ...	2-4-14	About 6 months.	13-10-14	1850 lbs.
Do. do. ...	3-4-14	Do.	14-10-14	1484 "
Yellow Hogan ...	27-4-14	Do.	2-11-14	1892 "
100 Day Bristol ...	12-3-14	Do.	24-9-14	648 "

Second Season.—Area, 44 Acres.

Variety.	Planted.	Duration.	Harvested.	Yield per Acre.
Hickory Horse Tooth	14-11-14	About 5 Months.	20-5-15	714 lbs.
Ladysmith White ...	31-10-14	Do.	9-4-15	1208 "
Do. do. ...	7-11-14	Do.	26-4-15	1194 "
Do. do. ...	2-11-14	Do.	10-4-15	961 "
Iowa Silver Mine ...	3-11-14	Used as Green Fodder to Cattle.		
Lousiana	16-11-14	... ...	Failure.	... ...
100 Day Bristol ...	5-11-14	About 5 Months.	27-4-15.	1050 lbs.

The new variety, Ladysmith White, gives promise of being very successful. In the November season an area of $9\frac{3}{4}$ acres from which the average yield was 1208 lbs. gave some noteworthy results. $5\frac{1}{2}$ Acres of this had the previous season been fallowed and on the remaining portion there had been a crop of Tobacco. Almost from the time of germination a marked difference could be seen in the health of the young plants on the various plots and as the crop grew older the difference became greater. The final result was that on the fallow plot we harvested 700 lbs. per acre and on the plots which had previously carried tobacco the yield was 1,720 lbs. per acre. The rainfall was extremely meagre and I think this yield was achieved in great part by means of constant cultivation. Another area of 5 acres of the same variety of maize following a bean crop yielded 1,194 lbs. per acre, but it was planted a week later and when rain was short, this would make a difference such as to partly spoil comparisons between the relative effect of tobacco and beans on a succeeding crop of maize. One thing, however, seemed to be clearly shown, namely that it is not advisable to have land lying fallow with a view to benefitting the succeeding crop. This experiment will be repeated at the first opportunity.

BEAN VARIETY EXPERIMENT.

1st Season:—Area, 23·84 Acres.

Variety.	Planted.	Duration.	Harvested.	Yield per Acre.
	1914	About	1914	
Rose Coco...	23rd, May	4 Months	25th, Sept.	663 lbs.
Canadian Wonder ...	18th ,,	Do.	16th ,,	567 ,,
Stringless...	Do.	Do.	17th ,,	400 ,,
Butter	Do.	Do.	Do.	652 ,,
Noyau au Blanc	21st, May	Do.	16th Sept.	200 ,,
Rose Coco...	15th ,,	Do.	21st ,,	681 ,,

2nd Season:—Area, 21·32 Acres.

Variety.	Planted.	Duration.	Harvested.	Yield per Acre.
	1914	About	1915	
Canadian Wonder ...	7th, Nov.	4 Months	23rd, Feb.	333 lbs.
Rose Coco...	14th ,,	Do.	27th ,,	331 ,,
Noyau au Blanc ...	13th ,,	3 Months	16th ,,	456 ,,
Rose Coco...	9th ,,	4 Do.	27th ,,	400 ,,
Noyau au Blanc	18th ,,	3 Do.	17th ,,	292 ,,

Beans continue to give fairly satisfactory results in spite of the drought. This crop should become a very valuable one under present world conditions and probably many settlers will be enticed to give it attention, both on account of the financial prospects and the benefits which will accrue to the soil growing it.

PEAS VARIETY EXPERIMENTS.

1st Season:—Area, 2·25 Acres.

Variety.	Planted.	Duration of crop.	Harvested.	Yield per Acre.
	1914	About	1914	
American Wonder ...	4th May	4 months	26th Aug.	447 lbs
Strategem ...	11th May	Do.	17th Sept.	732 „

2nd Season:—Area, 3 Acres.

Variety.	Planted.	Duration of crop.	Harvested.	Yield per Acre.
	1914	About	1915	
American Wonder ...	9th Nov.	3 months	12th Feb.	104 lbs.
		About		
Telephone ...	Do.	4 months	1st March	466 „
Strategem ...	Do.	Do.	5th March	310 „

The same remarks made on beans also apply to this crop. Some difficulty may be experienced in harvesting the crop on a large scale where labour is scarce, as no satisfactory machinery seems to be available for economic threshing in a country where the pods rapidly become so dry and easily burst with consequent loss of seed.

WHEAT.

An area of Thew planted on 29th April and harvested on 25th September yielded at the rate of 427 lbs. per acre. Another lot planted on 9th November and harvested on 1st April yielded only 230 lbs. per acre. This however, owing to the dry season was not affected by rust. Seven other varieties, all crosses, were also sown on 9th November. Their results were in most cases satisfactory and the best of them will be planted out on larger areas next season.

BARLEY.

The new Wisconsin pedigree variety has been planted both seasons and yielded at the rate of 265 lbs. to the acre, taking just four months to ripen.

EXPERIMENTS WITH POTATOES—FIELD CROP.

First Season.

Variety.	Planted.	Harvested.	Yield per Acre.			
	1914.	1914.	Tons.	Cwts.	Qrs.	Lbs.
May Queen	4th. May	15th. Oct.	0	16	1	6
Epicures	Do.	Do.	1	8	3	6
Factor	Do.	Do.	1	3	2	15
Midlothian Early ...	Do.	Do.	0	10	2	1
Up-to-date	Do.	Do.	0	10	3	18
Scottish Triumph ...	Do.	Do.	1	4	2	7
Early Regent	Do.	Do.	0	14	1	11
British Queen	Do.	Do.	1	7	1	3
Duchess of Cornwall ...	Do.	Do.	1	10	0	0
Ninety-Fold	Do.	Do.	0	11	2	24
Langworthy	Do.	Do.	0	17	1	21
King Edward	Do.	Do.	0	5	2	8

Second Season.

Variety.	Planted.	Harvested.	Yield per Acre.			
	1914.	1915.	Tons.	Cwts.	Qrs.	Lbs.
Langworthy	31st Oct.	15th Feb.	1	8	3	15
Epicure	Do.	Do.	1	12	2	7
British Queen	Do.	23rd March	1	17	3	1
Factor	Do.	Do.	0	14	2	3
Duchess of Cornwall ...	Do.	Do.	1	4	1	0
Early Regent	Do.	Do.	1	0	2	12
Midlothian early	Do.	Do.	0	17	1	14
Ninety-Fold	Do.	Do.	1	2	2	14
Scottish Triumph ...	Do.	Do.	0	19	1	26
May Queen	Do.	Do.	0	12	0	15
Up-to-date	Do.	Do.	1	5	1	23
King Edward	Do.	Do.	0	7	1	2

These varieties are now requiring to be renewed by having fresh seed imported from home. The results on the small plots given below were improved by a heavy dressing of farmyard manure.

EXPERIMENTS WITH POTATOES—SMALL PLOTS—

First Season.

Variety.	Planted.	Harvested.	Yield per acre.			
	1914.	1914.	Tons	Cwts.	Qrs.	Lbs.
Duchess of Cornwall ...	7th May	17th Oct.	4	6	3	4
Factor	,,	,,	4	14	3	18
Early Rose	,,	,,	1	13	0	24
Epicures	,,	,,	7	4	2	16
Langworthy	,,	,,	2	16	1	0
British Queen	,,	,,	6	16	2	12
King Edward	,,	,,	1	8	0	14
Up-to-date	,,	,,	2	16	1	0
Ninety-Fold...	,,	,,	2	0	0	20
May Queen	,,	,,	4	12	1	18

Second Season.

Variety.	Planted.	Harvested.	Yield per acre.			
	1914.	1915.	Tons.	Cwts.	Qrs.	Lbs.
King Edward	3rd Nov.	13th Feb.	1	9	2	26
Early Rose	,,	,,	2	1	3	4
Ninety-Fold	,,	,,	2	2	2	10
Epicures.	,,	,,	3	0	1	12
Langworthy	,,	,	2	0	3	26
Up-to-date	,,	11th Feb.	2	10	2	14
Factor	,,	5th March.	1	5	0	20
May Queen	,,	,,	3	0	1	2
Duchess of Cornwall ...	,,	,,	2	13	0	4
British Queen	,,	11th Feb.	7	0	2	14

EXPERIMENTS WITH WHEAT VARIETIES.

First Season.

Variety.	Planted.	Harvested.	Yield per Acre.
	1914	1914	
White Egyptian E/4 ...	23rd April	29th Sept.	1035 lbs.
„ „ E/1/4 ...	„	24th Sept.	450 „
I. M. Rieti	„	„	225 „
Type 17	„	„	1440 „
„ 8	„	„	360 „
Thew	„	„	540 „
White Loaf	„	„	810 „
Cross 4/5/3a.	„	13th Oct.	765 „
„ 4/5/2	„	„	630 „
„ 15/3/1	„	24th Sept.	270 „
White Loaf	„	„	630 „
Cross 13/7/6	„	„	135 „
Warren	„	„	540 „
	1913		180 „
Cross 11 B 12	27th Nov.	14th Oct.	810 „
	1914		
Cross 12	11th June	13th Oct.	495 „
Pusa No. 12	23rd April	24th Sep.	810 „
Cross 17/13/14	10th June	13th Oct.	
„ $\frac{B\ 25}{X\ 13}$ Bed 17 ...	„	„	1170 „
„ 11	11th June	„	1170 „
„ $\frac{B\ 21}{X\ 17}$ Bed 23 ...	10th June	„	900 „
„ $\frac{B\ 29}{X\ 17}$ Bed 24 ...	„	„	630 „
„ $\frac{B\ 27}{X\ 15}$ Bed 20 ...	„	„	495 „
„ $\frac{B\ 22}{X\ 10b}$ Bed 7 ...	„	„	1170 „
„ $\frac{B\ 16}{X\ 12}$ Bed 15 ...	„	„	900 „

EXPERIMENT WITH WHEAT VARIETIES.

SECOND SEASON.

Variety.	Planted.	Harvestd.	Yield per Acre.
	1914.	1915.	
Cross Egyption 3 & Nut Cut	10th Nov.	2nd March	444 lbs.
Cross Early Rieti & Thew..	,,	27th Feb.	562 ,,
Cross 13	,,	2nd March	667 ,,
Cross 17	9th Nov.	,,	585 ,,
Cross 12	,,	27th Feb.	810 ,,
Cross 13	7th Nov.	3rd March	692 ,,
Cross 12	,,	27th Feb.	765 ,,
Cross 11	,,	3rd March	945 ,,
Cross 10	,,	,,	817 ,,
Cross 13	12th Nov.	4th March	494 ,,

The weather this year suited the wheat crop and some fair yields were recorded as shown above.

EXPERIMENTS WITH MAIZE VARIETIES.

FIRST SEASON.

Variety.	Planted.	Harvested.	Yield per acre.
	1914.	1914.	
Champion White Pearl ...	4th May	31st Oct.	2205 lbs.
White Capped Dent Minnesotta No. 13 ...	24th April	2nd Sept.	2115 ,,
Champion White Pearl ...	6th May	31st Oct.	2340 ,,
Improved Yellow Dent Minnesotta No. 13. ...	22nd April	2nd Nov.	2430 ,,

SECOND SEASON.

Variety.	Planted.	Harvested.	Yield per acre.
	1914.	1915.	
Improved Yellow Dent Minnesotta	18th Nov.	16th March	2070 lbs.
Wisconsin No. 7 (White)...	3rd Nov. 1915.	4th March	3210 ,,
Wisconsin No. 12 (Yellow)..	3rd Nov.	4th March	3660 ,,

Two new varieties Wisconsin No. 7 and 12 were planted in the short rains. This seed I have had on hand for some time. The season was very poor and the yields are the more remarkable on that account. One variety is white and the other yellow and both matured very rapidly. They possess possibilities which we shall have to test further ere we can put them on the markets.

EXPERIMENT WITH BEAN VARIETIES

SMALL PLOTS.

Variety.	Planted.	Harvested.	Yield per Acre.
	1914	1914	
Horse	23rd April.	24th Sept.	855 lbs.
Canadian Wonder ...	30th ,,	13th August.	315 ,,
White Coco	23rd ,,	28th ,,	990 ,,
Schmalzbohnen	Do.	Do.	1,058 ,,
Butter	Do.	13th August.	1,170 ,,
Noyau au Blanc	4th. May.	Do.	203 ,,
Rose Coco	Do.	28th August.	652 ,,
Canadian Wonder... ...	Do.	13th ,,	630 ,,
French Coco	Do.	Do.	338 ,,
Flagelot...	Do.	Do.	833 ,,

SECOND SEASON.

Variety.	Planted.	Harvested.	Yield per Acre.
	1914	1915	
Canadian Wonder ...	20th Nov.	14th Feb.	632 lbs.
Horse	6th ,,	12th March.	315 ,,
White Coco	7th ,,	14th Feb.	630 ,,
Rose Coco	Do.	Do.	562 ,,
Butter	18th Nov.	Do.	315 ,,
Broad	3rd ,,	12th March.	600 ,,
Noyau au Blanc	16th ,,	13th Feb.	315 ,,
Flagelot	Do.	18th ,,	585 ,,
Schmalzbohnen	Do.	Do.	203 ,,

These results are all from selected seeds of the various varieties and are satisfactory.

EXPERIMENT WITH PEAS, LENTILS AND GRAM.

FIRST SEASON.

Variety.	Planted.	Harvested.	Yield per Acre.
Peas Telephone	4-5-14	24-9-14	1,110 lbs.
,, Marrow	,,	28-8-14	180 ,,
,, American Wonder ...	,,	,,	338 ,,
Lentils	7-5-14	13-8-14	563 ,,

SECOND SEASON.

Variety.	Planted	Harvested.	Yield per Acre.
Peas Telephone	7-11-14	23-2-15	315 lbs.
„ Small Field	16-11-14	Failed to grow out	
„ American Wonder ...	„	23-2-15	45 „
Lentils Egyptian	16-11-14	17-2-15	618 „
Gram Indian	3-11-14	16-2-15	675 „
Lentils	16-11-14	16-3-15	225 „

Some Winconsin barley sown on 24th April and harvested on 24th September yielded 990 lbs. to the acre, while that sown on 9th May and harvested on 29th September yielded 518 lbs. This difference in yield was due entirely to the earlier sowing receiving the greater quantity of rain and gives some idea of the urgency there is for seed to be sown as early as possible where the crop is one which requires rain for its success. This experiment was repeated in the short rains and a plot sown on 3rd November and reaped on 23rd February yielded 450 lbs. to the acre while another sown on 14th November and reaped on 13th March gave only 158 lbs. to the acre.

ROTATIONS.

Last year I gave a summary of the results for some previous seasons and these experiments are still going on. The results will, however, not be published until the end of another rotation has been reached. A 5 course rotation on a field scale has been commenced, each crop being on an acre plot.

Crop.	Planted.	Harvested.	Yield per Acre.
	1914.	1915	Tons cwts. qrs. lbs.
Potatoes	30th Oct.	15th Feb.	1. 8. 3. 25.
Maize	2nd Oct.	10th April	961 lbs.
Barley	31st Oct.	24th Feb.	201 „ seed 723 „ straw
Beans	9th Nov.	18th Feb.	400 „
Teff grass	9th Nov.	18th Jan.	89 „ seed 911 „ hay

In the above experiment one rotation is really being repeated five times, and it will be 2½ years, having regard to our double season, ere we have the complete result on one acre. In each case the potato crop receives about 15 tons of farmyard manure on the acre and in addition a dressing of 200 lbs. of Superphosphate. The season was extremely dry scarcely 8 inches of rain being available for the crops. The yield from the

potatoes would have been much higher had the porcupines left them alone. Next season the maize crop following the potatoes should show a marked improvement and so on as each successive crop follows. The Teff grass gave a good yield of seed and some very fine hay. The above crops have been chosen for the rotation on account of their being least affected by diseases and thus more reliable for our experiment. Others such as Linseed, Wheat or Peas could nevertheless be suitably introduced where operation were being carried out on a large acreage. No land is ever likely to successfully bear the same crop year after year.

EXPERIMENTS WITH VARIOUS CROPS.

Paspalum Dilatatum is a good forage grass and we are increasing our area of it.

Teff Grass only takes two months to mature and yields very fine hay.

Arrowroot (Maranta arundinacea) Some small plots of this planted on 22nd May 1913 were dug up on 23rd November 1914 and gave rhizomes at the rate 5 tons 4 cwts 1 qrs 24 lbs. per acre. We extracted from this a very fine sample of Arrowroot at the rate of 450 lbs. per acre. In May a quarter acre was planted out in the field and the result from this will be available next year. It has grown well and is very hardy.

Jersey Kale and Rape.—A small area of this is always kept for feeding purposes and is extremely useful.

Mangels.—An acre of these grew well and have provided much useful feed for the stock bulls etc.

Broom Corn.—This continues to give promise of being one of our future reliable crops.

PESTS.

Birds continue to be present in numbers. Porcupine were also numerous this year. Caterpillar attacked the Linseed but cutworm seemed to be less in evidence.

HOMESTEAD.

No money was available for buildings this year owing to the war.

LABOUR.

This has been fairly satisfactory during the year.

LIVE STOCK.

All the cattle were inoculated for Rinderpest in July, Fifteen died, and three Native, one 2nd Cross nine 1st Cross. four Ayrshire and one Red Poll cow aborted. A successful sale of Native cows with grade calves took place in March.

Pigs have been healthy throughout.

The following stock were despatched from the farm during the year :—

24	...	Grade Cattle
64	...	Cows
22	...	Oxen
4	...	Mules
70	...	Pigs

Total all classes 184.

STOCK ON HAND.

The farm was carrying at the end of the year :—

Cattle	...	305
Sheep	...	82
Horses	...	3
Mules	...	3
Pigs	...	100
Eland	...	4

Visitors.—Before the outbreak of war visitors were numerous, but the attendance fell off until towards the end of the year when interest again revived.

Staff.—Mr. Macnaughtan, my assistant has executed his work efficiently. He went on leave in January. Mr. J. D. Ritchie, clerk, who goes on leave in April performed his duties satisfactorily and assisted me in Mr. Macnaughtan's absence. Mr. J. J. Adams has been busy propagating citrus and on safari amongst settlers giving advice. Mr. R. Dedonckele has also done considerable safari work. Many settlers have shown great interest in the Flax industry.

I have the honour to be,

Sir,

Your obedient servant,

(*Signed*,) J. JOHNSTON,

Manager.

ANNUAL REPORT

OF THE

AGRICULTURAL INSTRUCTOR.

FOR THE

YEAR ENDING 31st MARCH, 1915.

DEPARTMENT OF AGRICULTURE,
NAIROBI EXPERIMENTAL FARM,
KABETE.

TO THE HONOURABLE
THE DIRECTOR OF AGRICULTURE,
NAIROBI.

Sir,

I have the honour to submit my first Annual Report *viz.* for the year 1914-1915.

On my arrival I found an orchard of some years standing, full reports on which have been made in the past by the Manager.

A summary of the varieties of fruit which are the most promising is as follows :—

CITRUS.

Oranges.—The Navels are undoubtedly the best as regards size, quantity and quality of fruit. These are Washington Navel ; Thompson's Improved Navel and Navalencia.

Of the others Ruby Blood and Late Valencia may be mentioned as having produced good fruit.

Naartjes or Mandarins.—The Cape Naartje, Bombay Mandarin and Emperor Mandarin produce large numbers of fair quality fruit, but just lacking the sweetness which would make a good marketable fruit. This may improve in time.

Lemons.—Villa Franca ; Genoa ; Lisbon and Sweet Rind have all made splendid growth, bearing fruit of excellent quality and in such numbers that a third of the fruit has to be picked

off to prevent the branches from breaking down with the weight. Eurekas are not satisfactory probably owing to faulty bud union as in other parts of the Protectorate they have made good growth.

Grape Fruit.—Marsh's Seedless is doing well giving good crops of fruit but rather thick skins and somewhat lacking in pulp.

Limes.—Tahiti are the best variety, but have not proved very successful probably for the same reason as applies to the Eureka Lemons.

DECIDUOUS TREES.

Almonds.—Papershell, Nonpariel and I. X. L. have grown well and flower freely but do not give large crops.

This is to be expected as to grow Almonds successfully they must be grown in large blocks.

Figs.—White Genoa, Madeline, Black Alicant; White Adriatic all grow well and carry plenty of fruit but usually drops off before ripe owing to lack of moisture.

Cherries.—A failure.

Apricots.—These trees have made good growth but have not borne any fruit probably through lack of moisture.

Apples.—All the varieties have made but poor growth. A few however have done better than others, viz :—Ballarat Seedling, King of Pippins, King of Tomkin's County, Rome Beauty, Scarlet Nonpariel, Smith's Cider, Lord Wolesley, Rhode Island Greening, Versfelds, Stone Pippin, Jonathan and Ohenimuri.

Pears.—All the old trees are failures, but as stated below in connection with the Nursery work, present trials are most promising.

Peaches.—The Chinese Peaches; Angel; Pallas and Walds produce large corps of excellent fruit. The Angels are the best. Florida Crawford produce largely but fail to ripen well.

Plums.—Of the 15 varieties grown here only the 7 kinds of Japanese Plums are doing well the best among these are October Purple, Satsuma, Sultan, Kelsey and Wickson's. The first three are prolific bearers and the fruit of good size and quality.

Quince.—5 kinds of these of which the best are Meechs' Prolific and Rae's Mammoth with Orange and Portugal next.

WORK DONE IN ORCHARD.

A dressing of Kraal Manure was given to all deciduous trees after pruning and the trees have responded wonderfully to the

treatment. On the whole the Orchard is doing fairly well but as there are such a large number of varieties in so small an area and only a few trees of each, uniformity is lacking.

THE NURSERY.

About 40,000 seedling Lemon stocks were raised from seed, 10,000 of these have been planted out in rows in the Nursery to be budded.

2,000 Lemon stocks raised from seed last year were planted out and budded with Oranges, Lemons and Grape fruits and have done very well especially the Lemons. These have been distributed to settlers for experimental purposes at low prices.

Deciduous fruit tree stocks imported from France have been budded and made rapid growth.

Pears.—Having a few Pear stocks I took buds from some of the old trees and some kinds have made a growth of from 2 to 4 feet in three months. This is better than one would have been led to expect and the results of further developments will be made known later.

Peach stones collected on the orchard in 1914 were sown and have now been budded with Japanese Plums. These trees are now 4 to 4½ feet high.

The Grape Vines have been pruned and a dressing of manure given with satisfactory results, some varieties producing good bunches of grapes but were finally attacked by Mildew.

Pine Apples of medium size and good quality have been grown.

Cuttings of Vines, Figs, Quince etc., are doing well.

PESTS.

The following pests were noticed:—

Aphis.—Spraying with a Tobacco wash was found to be effective.

Mytilaspis pomorum attacked the Apples. Resin wash was successfully used.

Mildew attacked the grapes.

Fruit Fly.—In Plums and Peaches caused trouble. Spraying fortnightly with Arsenate of Lead from flowering to the time the fruits were nearly fully grown overcame the pest.

INSTRUCTION.

During the year a large number of settlers interested in fruit culture visited Kabete and received information in propagating and cultivation. Advice has also been given by correspondence, and farms, where fruit trees have been planted

visited and suggestions as to pruning and cultivation given. Several boys in the Reformatory have been taught the work necessary in an orchard and nursery and some have become proficient and successful budders.

VISITS TO FARMS.

In April a visit was made to farms at Njoro and in August to Nakuru. These districts are suitable for various fruits, some of the farms producing Peaches and Oranges of good size and quality also Apples, Grapes, Strawberries etc., do well. Citrus fruit trees, mostly seedlings, have made good growth for their age.

REMARKS.

In different parts of the Protectorate where necessary attention has been given to cultivation, pruning, irrigation etc., various fruits of good marketable value have been produced.

In October I took over the charge of all the experimental plots in the nursery and the results of the experiments carried out will be contained in the Manager's report.

During the absence on leave of the Adviser for Tobacco I had charge of the experiments here.

I have the honour to be,

Sir,

Your obedient servant,

(*Signed.*) J. ADAMS,

Agricultural Instructor.

ANNUAL REPORT

OF THE

FOREMAN PLANT INSTRUCTOR

FOR THE

YEAR ENDING 31st MARCH, 1915.

DEPARTMENT OF AGRICULTURE,
KABETE FARM, NAIROBI.

THE HONOURABLE,
THE DIRECTOR OF AGRICULTURE,
NAIROBI.

Sir,

I have the honour to submit my annual report on the flax industry in the Protectorate, for the year ending 31st, March 1915.

During the year I visited various districts. I confined my visits mainly to those settlers, who are already growing Linseed. In a few instances I was asked by settlers to inspect their farms. The latter were anxious that I should advise them on the possibilities of Linseed culture in their respective localities. During the illness of Mr. Samyn I managed the flax factory at Lumbwa, belonging to the Highland Flax and Fibre Syndicate.

I carried out during the year experiments on :—

(1). Production of a softer fibre with more spinning quality.

(2). The relative merits of imported and acclimatised seed.

To obtain a softer fibre four acres were sown on 29th, April. In this district the cold prevented the linseed from growing quickly, and the crop was only ready for harvesting during the first week of August. Owing to the density of the crop the seed was very small. It was also damaged by birds. The maximum yield of seed was 312 lbs. per acre. The average yield of seed and straw per acre was 4,700 lbs. Retting of this crop was carried out during the months of October and November. The loss of weight on 4,700 lbs. after threshing and retting was 1,164 lbs. leaving 3,536 lbs. of retted straw. We have no up-to-date

machinery working at Kabete so we were only able to deal with a percentage of straw. In this manner we obtained 13% of fibre, or 439 lbs. per acre. In the process of working up the good fibre, 8% of waste, or short fibre, was extracted. The fibre produced was of good quality. This year, in the long rains, I shall try to obtain the same quality with a larger yield per acre.

The next experiment was with different seeds. These plots were sown on 16th April, Plot 1, was sown with freshly imported seed. Growth was rather irregular. Flowering commenced in the first week of June. The crop was harvested on the 20th and 21st July. It was dry and ready for stacking on 20th July. Two tons six cwt. of straw were obtained and the loss from this by threshing and retting was 1,290 lbs. The seed yielded 634 lbs. per acre, and the retted straw 14% fibre or 552 lbs. There was 8·5% waste or short fibre. Plot 2, was sown with seed from seed once grown in B. E. A. Germination was regular and the young plants made rapid growth. Harvesting took place on 22nd July, and stacking on the 31st. Two tons 13 cwt. of straw were obtained and the loss from this by threshing retting was 1,410 lbs, or 23%. The seed yielded 510 lbs. per acre, and the retted straw 13-5% fibre or 625 lbs. There were 287 lbs. of waste or short fibre. Plot 3, was sown with seed twice grown in B. E. A. An attempt was made to harrow this seed in a little deeper and for this purpose the Disc harrow was used. Germination was very irregular and as an even growth is very essential for a good crop of fibre I consider this plot a failure.

SHORT RAINS.

A five acre plot was sown on 2nd November, and a three acre plot one week later. Growth was excellent until early in December. The rains failed and caterpillars appeared. The Caterpillars have never before attacked anything but the seed bolls. This time they nipped off the growing point making all further growth impossible. During November and December we had 6·10 inches of rain on 24 days, but practically all the rain fell in the first three weeks of November. The straw was only good for short or waste fibre.

REPORT ON 5 BALES SENT TO THE CROWN AGENTS.

Bale 5.—Flax planted in April and harvested in July 1914. Weight 146 lbs. "Well grown long, strong flax, very well retted and scutched, clean and good quality."

Bale 4. Special.—Flax planted in April and harvested in July, 1913, not laid by rain. Weight 223 lbs.

"Similar flax but with rather more spinning quality."

Bale 3.—Flax planted in April and harvested in July, 1913, not laid by rain. Weight. 187 lbs.

"Longer and better grown than bales 4 & 5. With rather more quality, strong but slightly discoloured by rain in places.

Bale 2.—Flax planted in March and harvested in July 1913, badly laid by rain. Weight 173 lbs.

Well grown, strong flax, very clean and well worked but harsh and of rather dry nature.

Bale 1. Flax planted in March and harvested in July 1913 badly laid by rain. Weight 145 lbs.

Coarser and harsher fibre, also shorter length then previous bales, rather brittle nature and weak."

"We congratulate you on the excellent workmanship and preparation of this flax. The very most has been made of the fibre and it will be very acceptable to spinners in this country as there is still a great scarcity of good flax."

"We will render a/c sales to the Crown Agents advising them of the prices obtainable. The value of the flax should be £90 to £100 per ton, but it is difficult to give an exact valuation now as there is really no market price for flax."

The above report is by Messrs. A. Wigglesworth & Co. It will be noticed that the London Flax merchants report very favourably on flax grown at Kabete. I am of the opinion that a still better flax can be produced at some places in the Highlands. At Lumbwa, where a flax factory is working now, practically all, the fibre is better than most we have obtained at Kabete. It compares in look, quality, and strength more with the home product. On one farm a small plot of three acres yielded about 17% fibre. At Londiani 16% has been obtained.

The Lumbwa Syndicate intended to rett in tanks but water could not be got from the river. All the Highland flax is, therefore dew retted. This is scarcely a drawback as less labour is required with this process than with the tank system.

If machinery can be obtained the flax industry will develop rapidly all over the Highlands. Some hundreds of acres will be sown this year at Lumbwa, where also another factory will be erected. I expect that eight other factories in various districts will be erected as soon as the machinery is procurable.

It would be advisable for settlers to adopt a co-operative system wherever possible, because the larger the factory the greater will the profit be per acre. Flax straw is very

bulky and will not bear the cost of transport over long distances by rail.

It is to be regretted that we were not able to get our own machinery from Belgium ere the war broke out.

I have the honour to be,
Sir,
Your obedient servant,

(Signed) R. DEDONCKELE
Flax Expert.

ANNUAL REPORT

OF THE

TOBACCO DIVISION

FOR THE

YEAR ENDING 31st MARCH, 1915.

DEPARTMENT OF AGRICULTURE,

TOBACCO DIVISION,

KABETE,

1st *April*, 1915.

THE HONOURABLE

THE DIRECTOR OF AGRICULTURE,

NAIROBI.

SIR,

I have the honour to submit the annual report of the Tobacco Division for the year ending March 31st, 1915.

During the year I was absent on leave from the 18th of May, 1914, to the 2nd of January, 1915. A full report of visits on behalf of the Government, I paid whilst on leave, to various tobacco growing centres in the United States of America has already been submitted.

In the period spent in the Protectorate visits were paid to the following districts :—Muhoroni (3 visits), Lukenia (3 visits), Malindi, Sabaki, Mtwapa, Kilifi, Sokoki.

The understated trials have taken place :—

(1) GOVERNMENT FARM, KABETE.

Plots 1914—Before leaving in May I had planted out plots of thirteen varieties of tobacco amounting to six and a half acres.

Unfortunately the season proved most unpropitious and only a very small quantity of four varieties was subsequently reaped and cured. The results obtained were therefore of little value.

The following short rains failed and planting was not attempted during that season.

Plots 1915.—Seedlings of the following varieties have been raised and the plots (5 acres) are now being planted out :—

Havana Comstock Spanish Zimmer's Spanish Connecticut Seedleaf	Cigar Tobaccos.
Kentucky Yellow Sterling Bright White Burley	These varieties previously grew well at Kabete.
Ragland's Conqueror Hester Yellow Pryor	Bright Tobaccos.

These plots have been arranged to follow the understated crops :—

(1) Broom Corn.
(2) Linseed.
(3) Fallow.

The object in the first two rotations is to produce a lighter leaf than has yet been grown at Kabete. The Cigar Tobaccos are to be grown after fallow.

These trials are planned to follow as far as possible the recommendations made in the report by Prof. W. R. Dunstan on the tobacco grown at Kabete in 1912.

Seed Distribution.—Seed, imported and when requested acclimatized, has been distributed for trials to planters at the following centres :—

Gazi. Muhoroni. Kibwezi. Malindi. Lukenia.	Partly Departmental Trials.

Masai Reserve.
Nakuru.
Sokoki.
Kilifi.
Nandi.
Kamiti.
Uasin Gishu Plateau,
Nairobi.

Report from the Imperial Institute on tobacco 1913.—Sample bales of six varieties of tobacco grown at Kabete in 1913 were sent home for report. These samples included both air cured and sun cured leaf. The report shows that these

types of leaf are not acceptable on the home market at highly remunerative prices. The type of leaf desired is a "bright" flue cured leaf, for which the Kabete soil is not suitable. Enquiries which I made when on leave bear out this opinion, which I have had the honour to state in previous reports.

(2) HOLLIN'S ESTATE, KIBWEZI.

Report from the Imperial Institute on tobacco 1913—Two sample bales of the leaf mentioned in my last annual report were sent to England. This leaf, as previously explained, had to be sun cured instead of flue cured in the proper manner; taking this into consideration, I am of opinion the report is most satisfactory. The report states, "The tobacco burnt easily and evenly in cigarette form, leaving a grey ash. The flavour was mild and the aroma free from pungency and not very pronounced."

The samples were submitted to four different firms of tobacco manufacturers. All these firms commended the Kibwezi samples and priced them at 6d. to 9d. per lb. a highly satisfactory price considering the rough method of curing and handling. It is, therefore, all the more to be regretted that this most favourable report has not been followed by the planting of another crop on the plantation.

(3) KILIMANYOTA ESTATE, KIBWEZI.

As stated in my last report I had started a trial on this plantation. Unfortunately it had to be subsequently abandoned as the necessary supervision was unavailable in my absence.

With the exception of the Hollin's Estate, all planting in this district is at present at a standstill.

(4) LORD KITCHENER'S ESTATE, MUHORONI.

Trials 1914.—Two and one third acres were planted out with the following varieties :—

White Burley,
Yellow Pryor,
Havana,
Connecticut Seedleaf,
Hester,
Goldfinder.

Mr. Perry informs me that all these tobaccos grew out well except the Connecticut Seedleaf which was a failure.

Afterwards, however, the tobacco became badly affected by "white mildew," all the lower leaves were rendered worthless and none but "tops" were reaped.

These were only cured very roughly owing to the absence of the Manager on duty at the time.

Since my return, I have visited the plantation and inspected the leaf, which, under the circumstances, is of a promising character. Some of the leaves were of quite a bright colour, and they were not coarse as might have been expected from the somewhat rich nature of the soil.

Trials 1915.—Further trials are proposed during the present season, It is hoped by planting later in the rains and by careful attention and spraying to avoid another attack of "white mildew."

Part of the expense of these trials was borne by the Department.

(5) LUKENIA.

Trials 1915.—Trials will take place on Mr. F. B. Hill's Estate with the following varieties :—

Ragland's Conqueror	Imported American Seed,
Goldfinder	supplied by the Dept.
Goldfinder...	Rhodesian Seed.

Seedlings have been successfully raised and planting is now proceeding.

The light soils on this Estate seem suitable for light leaf, and should the rainfall prove sufficient, conditions seem favourable for the crop.

A flue-curing barn is to be built, and if the present trials are successful, the crop will be grown on a larger scale in the future.

Part of the expense of this experiment is borne by the Department.

(6) RONGAI.

Messrs. Armstrong Bros. inform me that last season was not a good one. They are continuing to experiment with various "white stem" varieties, which they consider suitable for the district.

(7) KAMITI PLAINS.

Lieut. B. E. A. O'Meara has continued to produce successfully tobacco of the South African "Boer" type. This is now on the local market. He is also trying cigar tobaccos from seed supplied by the Department.

(8) MALINDI.

Trials 1915.—I have arranged for a trial under the kind supervision of Mr. J. E. Jones at Malindi. The plots are on two classes of soil, coral and the sandy belt which stretches further inland.

The varieties to be tried are :—

Goldfinder, Ragland's Conqueror.	Bright American Tobaccos.
Havana, Zimmer's Spanish, Samatra.	Cigar Tobaccos.
Turkish, Yaka.	Turkish Cigarette Tobaccos.

The soils at Malindi and throughout many parts of the Coast lands are light, and seem promising for tobacco culture, but whether climatic conditions are such as to produce good growth, trials alone can show. The close proximity of the sea may also affect the leaf.

The Department is paying the expenses of this trial.

(9) POWYSLAND PLANTATION, KILIFI.

A small trial with light American and Turkish tobaccos is to take place on the light sandy soil of this Estate.

(10) SOKOKI PLANTATIONS.

Trials 1915.—This Estate lies several miles further inland than the above mentioned trials at the Coast, and the soil differs considerably from them. There are two distinct soils, a red sandy soil and a lighter sandy soil.

Mr. Lillywhite, the Manager, is arranging for plots on both these soils. The varieties to be tried are :—

Ragland's Conqueror Goldfinder	Bright American Tobacco.
Turkish	Smyrna Seed.
Turkish Yaka	Seed from the Imperial Institute.

Should these tobaccos do well, it is probable the crop would be planted to a much larger extent on this Estate.

(11) EAST AFRICAN ESTATES, GAZI.

I understand experimental plots are shortly to be started on this Estate, which I hope to visit at an early date.

(12) OTHER TRIALS.

The war has interrupted many of these trials, but planting is being continued on the Uasin Gishu Plateau, and in the Kiambu, Nandi, and Nairobi districts.

I have had no information regarding the trials in Jubaland.

Staff.—The appointment of a temporary assistant has been postponed owing to present conditions in the Protectorate.

I have the honour to be,

Sir,

Your obedient servant,

(*Signed.*) CHRIS J. MONSON,

Adviser for Tobacco.

ANNUAL REPORT

OF THE

MYCOLOGIST

FOR THE

YEAR ENDING 31st MARCH, 1915.

AGRICULTURAL DEPARTMENT,

NAIROBI,

June, 1915.

THE HONOURABLE,

THE DIRECTOR OF AGRICULTURE,

NAIROBI.

SIR,

I have the honour to submit my annual report for the year ending March 31st, 1915.

1. General.—Laboratory work during the year has been carried out under far more satisfactory conditions than has been hitherto possible, owing to the fact that a larger and more suitable room was placed at my disposal early in the year. This room, situated at the back of the building of the Department and away from the road, has proved fairly free of dust, and has made possible the preparation of culture media and the carrying on of pure culture work. By these means I have been able to identify and name parasitic and other fungi with which I have had to deal, work which was not possible last year.

Much of my laboratory work, however, has been seriously interfered with owing to my having to leave the laboratory for other pressing work outside, whilst in the middle of an investigation. Owing to this I have been so far unable to carry out to my satisfaction the work on the possible fermentation of sisal refuse and the isolation and identification of the organism responsible for the coconut bud-rot disease (see below.)

Under existing conditions I am at present in no position to carry out satisfactorily any research work of this nature.

The following visits were made during the year. From the beginning of April to the beginning of June, I was in Zanzibar and Pemba for the purpose of examining the Clove plantations in connection with the sudden dying off in large numbers of these trees. A report on this investigation was submitted at the time and is not enclosed here.

In October, I inspected the experimental and hybrid wheats on Lord Delamere's farm at Njoro, and again during the harvest in December. This subject is dealt with in a separate paragraph.

In January, I went up to Lumbwa to investigate a rumoured out-break of *Hemelia vastatrix.* The rumour proved to be incorrect, the yellowing appearance of the coffee plants which had excited suspicion was proved to be due to unfavourable soil conditions.

In February, I spent some weeks on a Citrus plantation at Chania Bridge, and carried on spraying experiments for the "wither tip" and "leaf spot" diseases. A detailed account of these experiments will be found in another paragraph.

In March, I visited Gazi in connection with the "bud-rot" disease of the Coconut palm, and, in conjunction with Mr. Farmer, the Tropical Agricultural Instructor, arranged for material to be sent to Nairobi to be more thoroughly examined in the laboratory. The results of the investigation are dealt with under the Coconut palm.

II. Coffee.

(1) Hemelia vastatrix and spraying experiments.

(2) "Die-back" disease.

(3) Action of formalin on coffee seed and uredospores of H. vastatrix.

(1) Although *Hemelia vastatrix* first reported in October 1912, from one or two places is now to be found on most plantations in the Kyambu and Nairobi areas, no appreciable damage has resulted nor is the disease likely to become a serious menace provided that the combative measures adopted during the last two years are steadily continued.

The disease is prevalent in the above named districts but by no means virulent, and as has been pointed out before the excellent soil and climatic conditions of those parts where coffee flourishes go a long way to help the planter to control this pest.

During the year two areas of Government owned coffee were expeimentally sprayed, the first in the long dry season (July to November), the second in the short dry season (January to March). The first of these coffee patches was situated in the grounds of the new Botanic Garden and comprised some 200 trees varying from ten to six years old.

When taken in hand in June the trees were in a very bad state of cultivation, surrounded by tall weeds and badly in need of pruning. The ground was thoroughly cleaned twice and the lower branches cut off before the application of any spray.

Between the months of August and November the trees were sprayed four times with three different sprays in the following manner:—

(1) Bordeaux mixture, full strength (the trees were not in flower).

(2) Bordeaux mixture made with calcium carbide in place of lime (the "carbide" spray).

(3) Liver of sulphur (4 ozs. to 10 gallons); 100 trees about 10 years old were not sprayed as they were completely defoliated by the leaf disease in conjunction with bad cultivation.

By the coming of the long rains in March, 1915, the disease had completely vanished, and at the time of writing no re-appearance has been noticed; the old infected leaves have long since fallen and have been collected and burnt; while the older defoliated trees have in all cases put forth new and healthy foliage.

In June, 1914, when this coffee was first cleaned all the trees were bearing a heavy crop, which was taken off before spraying operations were commenced.

It is to be noted that the older defoliated trees have not flowered since, while the younger plants put forth a few blossoms at the beginning of the year. That is to say in June 1915 there will be no crop on the older trees and about one third of the previous crop of unripe berries on the younger plants. This is to be attributed to the heavy pruning and age of the trees in the one case and to pruning alone in the other.

The second patch of coffee to be experimentally sprayed was situated at the Government Asylum and consisted of over an acre of coffee some six to seven years old.

The area was divided into strips and sprayed once in January 1915 during the short dry season with varying strengths of four fungicides as follows:—

I. Ordinary Bordeaux mixture.

1.	Full strength	(3 lbs. Cu S04 to 30 gall.)
2.	Diluted	(2 „ „ „ „)
3.	„	(1½ „ „ „ „)
4.	„	(⅔ „ „ „ „)

II. Bordeaux mixture made with calcium carbide in place of lime:—

1.	Full strength	(3 lbs. Cu S04 18 ozs. Ca C2 to 30 gall.)
2.	Diluted.	(2 „ „ 12 „ „ „ „)
3.	„	($1\frac{1}{3}$ „ „ 8 „ „ „ „)
4.	„	($\frac{2}{3}$ „ „ $5\frac{1}{3}$ „ „ „ „)

III. Bordeaux mixture made with waste calcium carbide obtained from a Motor Garage in place of lime.

1.	Full strength	(3 lbs. Cu S04 to 30 gall.)
2.	Diluted	(2 „ „ „ „)
3.	„	($1\frac{1}{3}$ „ „ „ „)
4.	„	($\frac{2}{3}$ „ „ „ „)

IV. Burgundy mixture.

1.	Full strength	(3 lbs. Cu S04 11 lbs. Na2 CO3 to 30 gall.
2.	Diluted	(2 „ „ 7 „ 6 ozs „ „ „)
3.	„	($1\frac{1}{3}$ „ „ 5 „ 4 „ „ „ „)
4.	„	($\frac{2}{3}$ „ „ 3 „ 9 „ „ „ „)

The "carbide" spray, No. II as it has been called, was made as follows :—

1. 1 lb. copper sulphate dissolved in 4 gallons of water;
2. 6 ozs. calcium carbide were added to (1);
3. The mixture was made up to 10 gallons by the addition of water.

The presence of free copper sulphate was tested for by potassium ferrocyanide and if found, more calcium carbide was added until no more copper sulphate was indicated by the ferrocyanide test.

Spray. No. III was made as follows :—

1 lb. of copper sulphate was dissolved in 4 gallons of water in one tub, and in another tub some 10 lbs. of waste carbide was made into a paste with water which was finally made up to 10 gallons and stirred into a thin paste. The lime paste was stirred through calico into the copper sulphate solutions and the mixture tested from time to time with potassium ferrocyanide for the presence of copper sulphate. After the addition of 6 gallons of lime paste the mixture was found to contain no more copper sulphate. and hence contained the following quantities.

1 lb. copper sulphate,

6 lbs. lime and impurities from the carbide,

10 gallons of water.

The waste carbide as it comes out of the reservoir of an acetylene lamp appears to contain about 70% to 80% of lime together with impurities.

The Bordeaux mixture made by the addition of calcium carbide to a solution of copper sulphate probably contains ordinary Bordeaux mixture (basic sulphate of copper and calcium sulphate) together with an acetylene compound of cuprous oxide and some impurities.

The exact fungicidal action of the acetylene compound is not known; but one advantage which the presence of the black compound has is that it renders the whole mixture more adhesive. It is easier to cover foliage with this mixture than it is with ordinary Bordeaux mixture made from lime; and it must be remembered that it is the under side of the coffee leaf which has to be covered and not the upper surface, and that of the two the former is more difficult to wet than is the latter.

The results of the spraying of the Asylum coffee will be given in next year's report; but the following conclusions may be drawn from the experiment carried out at the Botanic Garden :—

1. Ordinary Bordeaux mixture of full strength completely checked the disease and in addition produced a stimulating effect upon the trees.
2. Bordeaux mixture made with calcium carbide in place of lime proved as effective a fungicide as (1), but had no stimulating effect, and in addition was twice as expensive as ordinary Bordeaux mixture.
3. Liver of sulphur proved to be just as effective as (1) and (2) in controlling the disease, was much less expensive than either, and moreover the unsightly appearance of the foliage produced by (1) and (2) was avoided as this spray is nearly invisible.
4. A properly pruned tree required less than half as much material as did an unpruned tree, and it is to be noted that most of our plantations contain for the most part unpruned plants.

The liver of sulphur was not used on the Asylum coffee as the supply had run out and for the time being no more could be obtained. This spray, however. will be put on to the Asylum coffee this long dry season together with further applications of the others mentioned.

It must be borne in mind that these experiments were carried out at an altitude of 5,600 ft. with an average annual rainfall of 35 inches and a temperature varying between 37° F. and 84° F. The results do not necessarily apply to other places where climatological conditions are different, such as regions close to the Lake or near the Coast.

The leaf disease due to *Hemeleia vastatrix* has been now under careful observation for two years, and the following observations have been made as to its course on coffee trees of the Nairobi—Kyambu areas :—

1. The disease decreased towards the end of the dry season (September) and increased again about half way through the long rains, i. e. in May. The increase, that is the visibility due to the number of plots on and consequent yellowing of the leaves, reached a maximum towards the middle of the long dry season, i. e. in August, when in some cases all the leaves were shed. The minimum was reached in the short dry season, in December, when all the old infected leaves had fallen, but the newer ones were free of the disease; so that the presence of the rust was hardly to be noticed.
2. On plantations which have been kept constantly clear of weeds, and in addition have been pruned, the disease disappeared between December and March; but re-appeared at the close of the long rains.
3. On plantations which in addition to good cultivation have received one application of a fungicide on part of the coffee only and not on the whole, the same holds true.
4. On the experimental plot at the Botanic Garden which was kept clear of weeds, pruned, and sprayed four times, the disease has vanished and not re-appeared.

The following table gives the cost per acre of material alone for pruned and unpruned trees over 4 years old. The material for the fungicides can be bought in the country at the following rates :—

Copper sulphate (blue stone).	Rs. 42 per cwt.
Calcium carbide	„ 45 „
Washing Soda	25 cents per lb.
Liver of sulphur (potassium sulphide)	60 cents per lb., for 28 lbs.
Lime (local)	Rs. 3-50 per load (300-400 lbs.).

10 gallons of spray were used to cover 44 trees.

1. Ordinary Bordeaux mixture.
   1. Unpruned trees, 7 ft. x 7 ft. Rs. 8 per acre.
   2. Pruned „ „ „ 4 „
   3. Unpruned „ 8 ft. x 8 ft. „ 6 „ (16 lbs. blue stone per acre).
   4. Pruned „ 8 ft. x 8 ft. Rs. 3 per acre.

II. Carbide mixture.

1. Unpruned trees 7 ft. x 7 ft. Rs. 12 per acre.
2. Pruned „ „ „ 6 „
3. Unpruned „ 8 ft. x 8 ft. „ 9 „
   (16 lbs. blue stone plus 6 lbs. calcium carbide per acre).
4. Pruned 8 ft. x 8 ft, Rs. 4-50 per acre.

III. Burgundy Mixture.

1. Unpruned trees 7 ft. x 7 ft. Rs. 26 per acre.
2. Pruned „ „ „ 13 „
3. Unpruned „ 8 ft. x 8 ft. „ 20 „
   (16 lbs. blue stone plus 60 lbs. soda per acre.)
4. Pruned „ 8 ft. x 8 ft. Rs. 10 per acre.

IV. Liver of Sulphur.

1. Unpruned trees 7 ft. x 7 ft. Rs. 3 per acre. (5 lbs. per acre.)
2. Pruned „ „ Rs. 1-50 per acre.
3. Unpruned „ 8 ft. x 8 ft. „ 2-40 „
   (4 lbs to the acre.)
4. Pruned „ „ „ 1-20 per acre.

ii. The "Die-back" Disease.

Observation and investigation of the "die-back disease prevalent on many plantations have not led to the discovery of any parasitic fungus likely to be its cause.

I am of the opinion that the effect is physiological and is due rather to a complex of causes, chief of which may be mentioned the following :—

1. Over-production on young trees.
2. Weakness due to the ravages of cutworm and bad cultivation.
3. Bad planting out resulting in poorly developed tap roots.

(iii) Effect of Formalin on the Uredospores of *H. vastatrix*.

Experiments were carried out to ascertain what strength of formalin would kill the spores of *H. vastatrix* in the shortest time. This work was much interrupted and is still in progress, but the results so far obtained are given below.

AO. 1% solution of formalin will kill the uredospores after 74 hours.

Some two or three samples of seed for distribution and for sale have been treated in this way; others have been treated by a O. 3% solution for 12 hours. The germination of the coffee seed was retarded to 8 and 10 weeks.

The uredospores, as they are formed on the leaves and if kept without any treatment, will live for at least three weeks.

III. EXPERIMENTAL AND HYBRID WHEATS.

1. **Njoro.**—At Lord Delamere's farm this season Mr. G. W. Evans had some 600 acres under wheat comprising some 250 types, varieties, and hybrid strains, in both large and small plots.

As regards the resistance to rust many of the Rieti hybrids continued to do remarkably well, as did also the following type wheats :—

Equator,
Neapolitan,
Ushers,
Madonna,
Persian.

A consignment of both these was obtained by the Department for distribution in small quantities to the settlers on the Plateau and to others interested in wheat growing.

It is expected that these will be sown during the long rains of 1915, so that by next November it will be possible to gain some idea as to how those various wheats have done.

II. **Kabete.**—The wheats grown during the long and short seasons, i. e. from May to November, and from November to March, did extremely well as regards resistance to rust and length of straw.

The failure of the short rains in November was no doubt responsible for the short straw of all the wheats grown.

The following hybrid wheats did especially well for the two seasons :—

1. Cross No. 10 (Early Rieti and Thew).
   1. Awnless.
   2. Short beards
2. Cross No. 11. (Rieti and Red Fife.)
   1. Awnless
3. Cross No. 12 (Egyptian No. 3 and Yellow Fife).
   1. Red Chaff.
   2. White Chaff.
4. Cross No. 13 (Egyptian No. 3 and Nut Cut).
   1. Awnless.

5. Cross No. 17 (Early Rieti and Moulds).
   1. Red Chaff
   2. White Chaff.

The above are all short duration wheats and take 4 to 4¼ months in which to reach maturity.

In June, 1914, the cage and nursery plots only were sown; but owing to the large yield sufficient seed was obtained not only to continue the cage experiments but also additional plots in the field.

As regards rust these field trials did remarkably well and yielded enough grain to sow an acre of each next May (1915.)

It will be seen that the Rieti crosses have done equally well both at Njoro and at Kabete, places representative of districts of different soil and climate conditions.

It remains for the future to show whether these hybrids will retain the high resistance to rust which they now exhibit. In the meantime they will be sown over larger areas at both places, and small quantities will be tried as an experiment in other districts.

The following type wheats did well in the long season at Kabete, but were not sown in November as they all take 5 to 6 months in which to mature :—

White Egyptian No. 4.
Indian Type 17.
White Loaf.

The most serious pests attacking the wheat have been numerous flocks of small birds and pigeons. In some cases nearly half the crop was destroyed by the marauders, and as they do most damage just before sunrise it is not at all an easy matter to deal with them.

IV. CITRUS TREES.

"Wither-tip", "Leaf spot" and "Nail head rust" Disease.

A disease known in America under the various names of "Wither-tip", "Leaf spot", "Lemon-spot", "Canker", and "Anthracnose". was first observed last year but was not identified until the following season.

It has been reported from the Thika, Nairobi, and Mua Hills districts.

The disease as it appears in East Africa not only resembles the above named American pest but in addition the "nail head rust", also of America, which does not attack the leaves, but the stems, branches, and twigs. In all cases recorded and examined here, leaves, branches, twigs, and fruit, were attacked.

The cause of the "Wither-tip" disease has long been known as the parasitic fungus *Colletotrichum glocosporioides*, and at one time the "nail head rust" was also attributed to the same organism. According, however, to the latest work on these diseases the latter is due to another fungus, namely *Cladosporium herbarium var Citricola*, although both organisms are often found associated in the same affected branch.

So far, only the parasitic fungus *Colletotrichum glocosporioides* has been found in specimens from Chania Bridge and Nairobi; but the investigation is still in progress, and it is hoped that it will be possible to discover whether the disease as it occurs in East Africa is caused by one or the other, or perhaps by both organisms.

It is also of interest to note that in America the lime is the most susceptible variety and is attacked by all forms of the disease (leaves, branches, and fruit), the lemon less so, and the orange is only attacked by the "Wither-tip" form of the disease. In East Africa, however, the reverse is true, the orange and the lemon are the most susceptible varieties and are attacked in all parts, but the limes are practically immune, and even in a badly infected orchard it is difficult to find an infected leaf on the limes.

Spraying experiments with three fungicides were carried on at Chania Bridge as follows:—

(1) A portion of the orchard was treated with the "carbide" spray.

(2) A second portion was treated with Bordeaux mixture.

(3) A third portion was treated with Lime Sulphur mixture.

Owing to the fact that ammonia was unobtainable in the country at the time, the ammoniacal copper carbonate spray, which has proved of such use as a preventative of the disease in Australia, could not be tried.

It is as yet too early to expect any results of the experiments and such will not be available until some six months time. It may be added, however, that as the disease has been checked and prevented from spreading both in Australia and America little doubt is entertained as to the final result of the spraying experiments carried out at Chania Bridge.

In addition to the actual spraying, emphasis was laid upon the proper cultivation of the orchard, i.e. pruning out of diseased branches and particularly the gathering up and burning of dead and infected leaves beneath the trees. There can be no doubt that such leaves if left upon the ground help in a great measure to spread the disease from tree to tree.

V. ROSE LEAF MILDEW.

The rose leaf mildew due to the parasitic fungus *Sphaerotheca pannosa* was again very prevalent on certain susceptible varieties of roses in the Nairobi area, and probably occurs wherever such are grown in the Protectorate.

Remedial measures in the form of spraying experiments were carried out at the private garden of the Director of Agriculture, where the following substances were used:—

(1) Flowers of Sulphur (dusted on).

(2) Half strength Burgundy mixture.

(3) Half strength Bordeaux mixture.

Powdering with sulphur although producing good effect as a fungicide was discontinued owing to the prevailing high winds at the time. Both the copper sulphate sprays proved effective as regards the fungus, but scorching of the foliage also occurred on certain varieties of roses.

As has been mentioned above, no liver of sulphur was obtainable in the country, so that this substance could not be tried, but is to be recommended in preference to any of the above. The solution of liver of sulphur (potassium sulphide) deposits sulphur on standing, so that the foliage is eventually covered with a fine film of sulphur; moreover, the liquid nature of the material enables it to be applied irrespective of winds.

These experiments are to be continued next dry season. In view of the fact, however, that varieties of rose exist quite immune to the disease and can be seen in most gardens growing in close proximity to susceptible varieties, it would be simpler and more economical to grow only the former.

VI. THE BUD-ROT DISEASE OF THE COCONUT PALM.

Towards the end of the year I again visited the Gazi coconut plantations, and found that a large percentage of the older palms of 5 to 6 years were succumbing to a bud-rot and also to a root-rot disease. Most of the affected palms were suffering from both diseases.

The report on this visit is not included here, but the conclusion was reached that the soil conditions of the greater part of the plantation were unfavourable for the flourishing of the coconut palm. This opinion was confirmed by Mr. Farmer, who also carefully examined and reported on the same plantation.

Under the existing conditions it was considered impossible to deal with the diseases in any other way than by constructing a proper drainage system and by manuring.

At the same time a quantity of material was sent up to Nairobi for the identification of the "bud-rot" and "root-rot" organisms. Unfortunately, the specimens were much delayed in transit and reached Nairobi in a very dried up condition.

From the single "bud-rot" specimen which survived several bacteria were isolated, one of which closely resembled the *Bacillus Coli communis* reported to be the cause of the disease in Ceylon and the West Indies.

The work was unfortunately interrupted at this stage by my leaving Nairobi in order to sow experimental wheats at Kabete.

It is hoped, however, that an opportunity will present itself for continuing the work during the ensuing year.

VII. EXPERIMENTS TO FERMENT SISAL WASTE.

Experiments on the fermentation of sisal waste were continued this year, but no very great progress was made owing to lack of time and opportunity to carry out such research work.

The results, however, confirmed those previously obtained. A preliminary analysis of the juice of leaves from the Coast gave just about the same value for the sugar content as was obtained for the Highland material, namely, not more than 3·0%.

In Yukatan, where sisal waste has been fermented with success and alcohol from such has been put on the market (according to report), the sugar content never went below 9·4%, and at the end of their long dry season is stated to have reached as much as 14·1%. Most of the alcohol was produced from leaves containing on the average 12 per cent sugar.

As stated in last year's report a yeast was isolated from sisal plants which fermented a glucose solution but which was quickly killed in the sisal extract. This was no doubt due to the action of organic acids in the extract which were present in great quantities.

On neutralisation with sodium carbonate and the addition of a small quantity of glucose, it was found possible for the yeast to live in the sisal extract; but no fermentation was induced.

Further work on more exhaustive analysis and on the neutralisation and destruction of the organic acids was not completed owing to the Analyst, for want of time, being unable to carry out experiments of this nature.

The work of discovering and isolating further yeast ceased on my part owing to my having to leave Nairobi for other pressing work.

It would be of great interest to continue the work, for the Analyst was by no means certain that the 3 per cent represented the whole of the sugars contained in the sisal juice. Moreover, the organic acids present might prove of importance (oxalic acid, for example, if found to be present in any quantity); but the whole problem is one of careful research which I am in no position at present to carry out.

VIII. THE BOTANIC GARDEN.

Early in the year His Excellency the Governor sanctioned the laying out of a Botanic Garden, the labour to be supplied by a gang of convicts from His Majesty's Prison.

For this purpose the grounds of the Provincial Commissioner's old residence on Ainsworth Hill were handed over to the Department and the work of clearing up was commenced in June. The grounds which are sadly neglected have been cleared of most of the blue gums and other trees and shrubs which were considered unsuitable, and in October a small area was put under the grass *Cynodon dactylon* obtained from the Government Experimental Farm at Kabete. This grass has done extremely well but there is still a large area to be sown as the Kabete farm could only supply a small quantity. Seed was not sown owing to the almost complete failure of the short rains. At the commencement of the long rains in March of this year, a hedge of *Cassia grandiflora* was put in.

Besides the work of clearing and keeping clean of weeds, the small patch of coffee (about 200 trees) in the grounds was also cleaned, pruned, and sprayed, and kept clean by the convict labour. This coffee constituted the experimental patch referred to under the paragraph " COFFEE " in this report.

Unfortunately, after the outbreak of the war the convict gang was often taken off for other purposes by the Military authorities, so that the work of cleaning, clearing, etc., was constantly interrupted. This has been all the more unfortunate, for instead of increasing the labour during the rains it was constantly wanting altogether, with the evil result that the weeds, etc., gained great headway and the laying down of grass became impossible.

It is to be hoped that this year the gang of convicts will be kept continually at the Garden, or if this proves impossible then some provision be made for a constant gang for labour similar to that employed at the Arboretum.

IX. MUSEUM AND HERBARIUM.

During the past two years many pathological specimens comprising the general fungus parasites have been preserved; but owing to the lack of room have not been exhibited. Frequent enquiries as to the appearance of a particular disease have been received by this Division throughout the year.

In this connection it may be stated that the Herbarium has largely increased and contains a large number of indigenous grasses, a list of which is to appear in the Agricultural Journal of the Department.

Frequent enquiries have been received with regard to the names and values of many grasses found on pasture lands. Most of these have now been named by Kew, and are to be seen in the

Herbarium kept for the present in my room. This year, however, the specimens will be arranged in a suitable cabinet to be kept in the General Museum of the Department.

X. PARASITIC FUNGI RECORDED DURING 1914-15.

To the list of Parasitic fungi recorded in last year's report I have to add the following :—

1.	Palm Leaf Disease.	Gyraphiola phoenicis.
2.	Leaf Spot and Nail Head Rust of Citrus Trees. (recorded last year but not identified).	Colletotrichum gloeosporiodes.
3.	Black Blight of Coffee. (following certain insect pests).	Apiosporium sp. or Capnodium sp.
4.	Heart Rot of African Cedar. (recorded last year and identified by Kew).	Fomes juniperinus.
5.	Anthracnose of Beans.	Gloeosporium lindemuthianum.
6.	Anthracnose or Bitter Rot of Apple.	Glomerella rufomaculaus.
7.	Root Disease of Coffee. (very rare).	Hymenochaete noxia.
8.	Ergot-like sclerotium of species of **Setaria**.	Clavicyss microcephala.
9.	Damping off of Coffee seedlings.	Fusarium sp.
10.	Covered smut of barley.	Ustilago hordie.
11.	Peach leaf curl.	Exoascus deformans.

I have the honour to be.

Sir,

Your obedient servant,

(*Signed*) W. J. DOWSON,

Mycologist.

ANNUAL REPORT

OF THE

COFFEE PLANTATIONS

FOR THE

YEAR ENDING 31st MARCH, 1915.

DEPARTMENT OF AGRICULTURE,

NAIROBI.

26th *April*, 1915.

THE HONOURABLE,

THE DIRECTOR OF AGRICULTURE,

NAIROBI.

Sir,

I have the honour to submit herewith my report for the year ending March 31st, 1915.

From April 1st, 1914, to August 5th, 1914, I visited and inspected 59 Coffee plantations; 9 in the Nairobi, Kiambu, Limoru, and Thika districts, 17 in the Lumbwa district, 1 in the Kisumu district, 5 in the Nakuru district, and 27 in the Muhoroni district, comprising an area of about 1,735 acres in coffee.

From August 5th, 1914, to August 28th 1914, I was enrolled as a volunteer, then, on being transferred to the Second Line of Defence, I returned to Nairobi to resume my duties as Coffee Plant Inspector. From that date until October 19th I wrote up reports on the plantations I visited earlier in the year, and inspected 4 plantations consisting of 155 acres. On October 19th, 1914, I returned to Military service, and remained away from Nairobi until I was invalided in November.

Since resuming my duties as Coffee Plant Inspector on January 14th, 1915, I have visited 15 plantations in the Nairobi and Kiambu district, comprising 536 acres under coffee.

On March 9th, 1915, I left Nairobi on a tour in the Kericho and Sotik districts; between that date and March 31st I visited 10 plantations in these districts, the reports on which I shall shortly complete. Since the time of my first visit to Kericho, in 1914, the

coffee has made better progress than I expected, but, owing to the altitude and the climatic conditions existing there, I still hold to my first opinion that the Kericho district is not nearly so good for coffee growing as are the other coffee districts which I have visited.

On my first visit there I recommended the use of temporary shade in the form of Congo peas until the permanent shade trees are well grown. This has proved of much benefit to the coffee.

During the early part of 1915, the Ordinance controlling the sale of coffee plants came into force, with the object of endeavouring to prevent the spread of *Hemeleia vastatrix* to areas at present free from disease. In January, the Mycologist and myself took charge of the culture of two patches of coffee, one at the Asylum and one in Nairobi in the shamba of Dr. Van Someren; the latter patch being badly infected with *Hemeleia vastatrix*. We have tried three or four different sprays on this coffee and have found Bordeaux mixture to be very satisfactory. The trees are now making good recovery, and I have hopes of, in a great measure, controlling the disease in this instance.

I may also say that, on the plantations where I have found *Hemeleia vastatrix*, and which I have visited more than once, the disease does not appear to have spread rapidly, nor does it seem to so greatly affect the health of the trees as it does in other countries.

I am of the opinion that, with the use of proper precautions, this disease will never be a serious menace to coffee growing in British East Africa. It is, however, necessary that due care should be exercised in the cultivation of the Estates, on which subject I have consistently advised the growers.

Some of the greatest damage done to coffee plants in this country is that done by Cut-worm. This grub only attacks the young plant, and by precautionary measures the damage can be greatly checked.

Another serious pest is the Antestia bug, for which, as far as I know, no practical preventive has been found. Experiments are, however being carried on by the Entomologist.

In September, 1914, 50 lbs. of Blue Mountain coffee seed were received from the Agricultural Department in Jamaica. This seed was distributed between the three Government Experimental Farms (*viz.* Kabete, Kibos, and Mazeras), the Forestry Station at Escarpment, and a small quantity was kept at my Office as a sample. From reports received I find that, at Mazeras the seeds germinated fairly well but shortly afterwards the plants were attacked by a fungoid disease, diagnosed by the

Mycologist to be a parasitic fungus belonging to the genus "Fusarium," which killed them; at Kabete germination was irregular, and, as the plants were not shaded, growth has not been satisfactory owing to the drought; and at the Escarpment Forestry station the plants are making very favourable progress. I have not yet received a report from the Agricultural Instructor in charge of Kibos farm.

I sowed a few seeds in a box at my Office: germination was irregular, but a good proportion of the plants are making headway now. My opinion of the seed is that it was not properly cured. This improper curing has affected the germination.

On many of the plantations which I have visited a second time, I have been pleased to find improvement in the methods of cultivation; and, in all cases, it has been satisfactory to see that the planters are ready to accept and make use of the advice and help offered.

There are still many coffee growing districts which I have not yet visited, such as Nyeri, Uasin Gishu, Nandi, etc., as well as many plantations in the Kiambu and Thika districts, which will take up the greater part of my time during the forthcoming year.

Manurial experiments will also be carried out during these rains with Safaga Bay phosphate on some of the plantations near Nairobi.

I have the honour to be,

Sir,

Your obedient servant,

(*Signed*) M. D. LE POER TRENCH,

Coffee Plant Inspector.

ANNUAL REPORT

OF THE

TROPICAL AGRICULTURAL INSTRUCTOR

FOR THE

YEAR ENDING 31st, MARCH, 1915.

DEPARTMENT OF AGRICULTURE,

MOMBASA,

3rd *April*, 1915.

THE HONOURABLE,

THE DIRECTOR OF AGRICULTURE,

NAIROBI.

Sir,

I have the honour to submit herewith the First Annual Report of my work as Tropical Agricultural Inspector in British East Africa.

On my arrival in the Protectorate in July last I took over my duties in Mombasa and received general instructions from the Hon'ble the Director of Agriculture as to my duties on the Coast land.

Owing to the outbreak of war and the condition of this country consequent thereon, the scope and area of my work was of necessity limited to the land north of Mombasa.

Since my arrival, I have undertaken safaris embracing the following coconut palm areas :—

(*A*) Visiting shambas of mixed produce and coconut palms in and around Mombasa.

(*B*) Mombasa to Mazeras Government Farm.

(*C*) Frere-Town, Uquin, Utanga, Junda, Mwakarungi, Ribe, to Rabai district.

(*D*) Changamwe, Kwa-Iomvu, Miritini to Mazeras district.

(*E*) Mombasa, Kisuni, and through the Coast villages, Mtwapa, Mwando-Wa-Panga, Shimolatewa, Kanami, Kilifi and Mnarani, Sokoki, Kipperani, Masumby and Tezo to Malindi district.

(*F*) Mombasa to Manguja through various villages, Kaya-Kambe, Jibana, Chonyi, Cha-Shimba, Mbuzi, Kaya-Kauma, Takaunga, Mtundia, Roka, Midia, Malindi district, Mumbrni district to Magarini.

(*G*) Kilindini to Mainland, Port-Ritz, Funguni, Coast, Wimbunie, Mtonga to Likoni district.

(*H*) Mombasa to "Gazi" plantations, and Tiwi district.

(*I*) The rest of my work being done in the vicinity of Mombasa, as per my reports.

The particular report marked (A), attached hereto, of the "Gazi" safari was undertaken by special instruction from the Hon. the Director of Agriculture.

When in Mombasa, I frequently received personal visits from owners desiring information regarding some special disease, etc., attacking their plantations. Also requests by correspondence from Plantation and Shamba owners desiring me to give an early visit to their property.

In many cases, I have found their coconut palms have been seriously attacked by beetles and white ants. In a few other instances, the trouble has been due to bud-rot and root disease, caused, in most cases, by diseased seed-nuts; also lack of tillage and proper drainage; careless and neglectful cultivation; allowing the property to be overcome by weeds, vines, and thick bush; and the omission of deep ploughing, or forking and the breaking up of the soil.

It is anticipated by most owners that the Coconut Palm Ordinance, when brought into force, will have a most beneficial result, causing negligent owners to keep their properties in good order, and having the desired effect of checking to a very large extent Tembo tapping, allowing the trees to produce better quality nuts and the development of a higher grade Copra industry in the Protectorate.

Of the many remunerative agricultural industries in British East Africa, I consider the coconut palm to be one of the most important, both as to the extent of the area under cultivation on the Coast land, north and south of Mombasa, and the capital invested; also the indispensable value of the product of the palm to the native inhabitants of the colony, providing them largely with the means for their daily requirements, food, drink, oil, etc.

The demand for coconuts amongst all classes causes the nut to have a ready sale or exchange, giving the natives great facilities for trading with the product of the palm.

Many owners have expressed their approval of the Coconut Palm Ordinance, hoping that it will check stealing and the sale of stolen nuts.

The Native Shambas on the Coast are very numerous, and many are owned by wealthy Arabs, East Indians, and in a few cases by Swahilis: these are in charge of Native Superintendents. But the majority of the smaller shambas are owned by various grades of Natives, and worked by their women and children. The size of their plots varies from one to ten acres, and, between the palms, catch crops are grown of vegetables, sweet potatoes, peas, beans, etc., also a variety of fruit trees and bananas; this class of cultivation being on a small scale.

At present the cultivation of coconut palms is largely in the hands of the native population, and, owing to lack of capital, is much neglected, not receiving the attention this industry requires, *viz.* clean weeding, drainage, ploughing, etc., and special labourers searching daily for beetles; thus in a large number of cases the palms are not kept in a healthy and vigorous condition.

It is regrettable that the shambas are not clean weeded, also dead and dying trees cut down, and those lying on the ground cut up and destroyed by fire. In most cases, when I have had such trunks cut up for burning, I have found beetles, eggs, grubs, and pupaes.

However, in spite of these drawbacks, the palms on the Coast, north and south of Mombasa, flourish to a very large degree and produce exceedingly well. Of course this is due to the suitability of soil and climatic conditions.

It is the desire of this Department to assist and instruct the Natives to improve their crude methods of cultivation, and to produce a larger variety of agricultural products on improved lines; this, however, will be a matter of time.

Tembo tapping is another feature of native ownership having many injurious and ruinous after effects on coconut palm growing.

(i) on the health and life of the tree, and

(ii) causing considerable disappointment a few years later to the planter, whether European or Native, who has invested large amounts to establish and develop a coconut palm plantation, and in his eagerness to secure seed-nuts, unknowingly purchases seed-nuts from Tembo-tapped trees, failure being inevitable in the long run, for should the palms grow up the yield will be very poor, varying from 20 to 30 nuts per annum. This return cannot compensate the Planter for the amount of Capital invested.

Other Natives will sub-let their palms to tembo-tappers and dealers for immediate gain at prices varying, according to locality, from one to three rupees per month per tree. It is regrettable to find such fruitful trees being tapped to death.

It is my desire to train and turn the attention of the Natives to producing cleanly prepared copra, sun-cured, from matured dried nuts: also coconut oil ; and coconut fibre, to be obtained from the husks.

The area under coconut palm cultivation has considerably increased during the year 1914-15, and, from assistance given and encouragement to the Planters and Shamba owners generally from this Department, it is estimated that during the year 1915-16 an increased area will be converted and put under palm cultivation; the present growers having realised the importance of this industry and the demand for the product in all European markets and the United States of America.

During the rubber boom, the plantation and shamba owners devoted their attention to rubber growing, and only in a few cases to both rubber and the coconut palm.

Since rubber has failed to be productive of revenue, planters have turned their attention to the palm industry, and, in most cases, are substituting coconuts for rubber, while others have considerably increased their coconut palm by interplanting between the rubber lines.

I have the honour to be,

Sir,

Your obedient servant,

Signed GEORGE FARMER,

Tropical Agricultural Instructor, Mombasa.

ANNUAL REPORT

OF THE

VETERINARY DEPARTMENT,

FOR THE

YEAR ENDING 31st MARCH, 1915.

OFFICE OF THE CHIEF VETERINARY OFFICER,

March, 31st 1915.

NAIROBI.

The following constituted the staff of the Veterinary Department, during the year 1914-1915.

Chief Veterinary Officer	R. J. STORDY.
Deputy Chief Veterinary Officer ...	W. KENNEDY.
Veterinary Pathologist	R. E. MONTGOMERY.
Veterinary Officers, (*13*)	R. EDMONDSON.
	A. G. DOHERTY.
	H. H. BRASSEY-EDWARDS.
	F. J. MCCALL.
	O. DIXON.
	A. S. LEESE.
	R. C. WHEELER.
	W. W. HENDERSON.
	G. N. HALL.
	F. J. SHEEDY.
	A. W. CARTER.
	T. C. BRADSHAW.
	M. H. REID.
Assistant Vet. Pathologist... ...	W. KEARNEY.
Permit Officer	J. B. BANKS.
Chief Clerk	J. W. JOHNSON.

Livestock Inspectors, (*six*)
Indian Veterinary Assistants, (*four*)

The following Officers proceeded on leave during the year:—The Chief Veterinary Officer on January 15th, 1915.

Mr. R. Edmondson on June 29th, 1914. Mr. Leese resigned his appointment on December 11th, 1914, and proceeded to England.

The following Officers returned from leave:—

Mr. W. Kennedy on April 15th, 1914, and Mr. R. Edmondson on January 4th. 1915.

The following Officers arrived on first appointment:—

Mr. F. J. Sheedy on July 25th, 1914.

Mr. A. W. Carter on September 20th, 1914.

Mr. T. C. Bradshaw on November 11th, 1914

Mr. M. H. Reid on November 11th, 1914.

Mr. Kennedy was appointed to the post of Deputy Chief Veterinary Officer on July 29th, 1914, in place of Mr. F. R. Brandt whose transfer to Nigeria as Chief Veterinary Officer was mentioned in last year's report.

DISEASES OF CATTLE.

East Coast Fever.—The following outbreaks occurred in the so-called clean areas during the year :—

Nakuru	3.
Uasin Gishu	6.

There are now close on 70 dipping tanks in working order throughout the country and the good results obtained have convinced the settler community of the efficacy of regular dipping at three day intervals as a preventive against East Coast Fever.

Notwithstanding the present military crisis there are several more dipping tanks being constructed by settlers. Owing to the war and the consequent cutting down of expenditure, the General Dipping Scheme for the Protectorate has not been proceeded with to any extent, as funds were not available for the erection of district and stock route tanks.

Until these tanks have been erected we cannot hope to establish universal dipping—and it is only by universal dipping that we can ever anticipate the suppression of East Coast Fever.

The Farmer is apt to criticise adversely the efficacy of dipping owing to cases of East Coast Fever occurring on farms where dipping is practised, but he should remember that the full value of dipping can only be appreciated when all his neighbours are dipping and the trek oxen and cattle from the reserves are regularly passing through dipping tanks. It is then, and then only, that we can look for diminution in the incidence of the disease.

Further, on highly infested veldt grazed over by susceptible cattle it must be remembered that cases of East Coast Fever will occur, but it has been conclusively proved that with regular three day dipping the mortality will be reduced from 95% to 5%.

I would again sound a note of warning to farmers in regard to handling and care of arsenical dipping fluids. A number of cases have come under notice during the year, where, through gross carelessness, farmers have suffered considerable losses from animals obtaining access to the very poisonous arsenite of soda.

The following extracts from a report submitted by the Acting Government Analyst are worthy of the attention of stock owners :—

"The number of dip samples received for analysis between April 1st, 1914 and March 31st, 1915 amounted to 565—an average of 47 per month."

"Only eleven settlers use 5 and 7 days dips so that it is quite apparent the country as a whole finds the three day interval most effective."

"The difficulty experienced in keeping dipping fluids up to strength is probably to be traced to the fact that the volume of the tank has been wrongly estimated. It is difficult to account in any other way for the extreme errors which sometimes occur. Occasionally a large error is to be traced to incorrect sampling of the tank but this does not often happen.

"Neither the measurement of water, weighing or dissolving the arsenic, nor sampling the tank are operations which can safely be left to "boys." Perhaps if settlers would realise this they would have less trouble in keeping their tanks in a satisfactory conditon.

"Unnecessary samples.—It sometimes happens that samples are sent at more or less regular intervals but of which the arsenic content show a progressive diminution extending over several months. It appears in these cases as if no attempt is being made to bring the tank to the requisite strength.

"The sending of samples is, therefore, merely a waste of time and money and should be discouraged as much as possible.

"Paraffin and Soft soap.—It appears to be necessary that these should be kept in the approximately correct proportions. They are of course used up in the process of dipping and require renewing just as much as does the arsenic.

"In one case I was informed that a dip deficient in paraffin failed to kill ticks though 10% too strong as regards its arsenic contents while the same dip did its work satisfactorily when soap and paraffin had been added although the arsenic had been reduced to the normal amount, for a three day dip.

"Relative merits of Cooper and Laboratory Dip.—No data are at hand though it seems probable that Cooper's dip is liable to more oxidation than Laboratory dip.

" Precautions should be taken to prevent cattle from drinking *the dip.*

" A case has occurred in which eighteen head of cattle were lost through arsenic poisoning as a result of one dipping. The dip was four per cent too strong ; an excess strength too small to have caused any damage.

" The conclusion is that the animals, which had not been dipped before, were thirsty and drank the dip."

The number of cattle, the property of settlers admitted to the Kamiti Testing Area during the year was 614. The number of deaths was 18, approximately 3%.

Rinderpest.—Twelve outbreaks of this disease occurred during the year on European owned farms. This disease is enzootic throughout most of the native reserves, and, owing to illicit movements of cattle from these reserves many outbreaks have occurred in the settled districts in the neighbourhood of these areas. Under present conditions, it has only been found possible to deal with outbreaks affecting European owned cattle and as all the settlers are now convinced of the efficacy of double inoculation, this operation has been carried out on an extensive scale in several districts with most satisfactory results.

The average mortality has been less than 1%. This is based on the results obtained among all classes of stock in such widely separated districts as Ngong, Kisumu, Nakuru, Kericho, Nandi and Londiani.

In the case of dairy herds abortion is to be expected as a result of double inoculation but in only one case did the number of abortions exceed 5 per cent. of all in calf cows and in that particular instance they amounted to 7·5%.

Arrangements were being made to double inoculate all cattle in the settled areas when war broke out.

Unfortunately the exigencies of Military service have since placed so much extra work on the Veterinary staff that it was found impossible to carry out the plans which had been made.

Upwards of 35,000 military cattle were double inoculated since the war began.

230, 384 doses of serum were sent out by the Laboratory during the year, as follows :—

East Africa	99,664
Northern Rhodesia	30,240
Bechuanaland	10,080
Southern Rhodesia	35,280
Mozambique	15,040
Union of South Africa	40,080

Anthrax.—During the period under review anthrax assumed the form of an epizootic in the Nairobi and Thika districts. Two outbreaks occurred on the Uasin Gishu Plateau. The only reason which can be assigned for the sudden increase of this fatal disease was the shortage of grazing throughout the country resulting in the cattle, owing to the unprecedented drought which was recently experienced, being compelled to graze closely and so ingest considerable quantities of infected soil.

As the causal organism of anthrax can exist in the soil for considerable periods, we must anticipate re-appearance of this disease whenever similar climatic conditions prevail. A vaccine against anthrax was produced at the Veterinary Laboratory and upwards of 23,000 doses were used with most beneficial results. Unfortunately, from some unknown cause, one particular issue of the vaccine regained its virulence with disastrous results. Nine valuable horses succumbing out of 23 inoculated. It must be remembered that anthrax is easily transmitted to the human subject and is a most fatal disease in man, therefore, every precaution should be taken to properly cremate, on the spot where they die, the intact carcases of all animals which die on the farm.

Pleuro-Pneumonia.—Notwithstanding the exercise of the greatest care, a recrudescence of this disease occurred in the Masai Reserve in April of last year.

Five villages were found infected and altogether 4,774 cattle were placed in quarantine. The mortality in these herds has fortunately not been a large one.

It is the difficulty of eliminating the old "lunger" that makes this disease such a serious one to cope with. It is fortunate for the preservation of the quarantine now imposed that the Masai themselves, who dread the disease, fully realise our endeavours to safeguard the other large herds within the Reserve.

Tuberculosis.—No case of tuberculosis has been recorded during the year under review. All imported cattle are re-tested with tuberculin on entering the Protectorate but this re-testing has been carried out so as to cause the owners as little inconvenience as possible as they have been allowed to take their cattle direct to their farms, under provisional quarantine, until the animals have passed the test to our satisfaction.

Quarter Evil.—Three outbreaks of quarter evil occurred during the year and there is every evidence that this disease is on the increase, particularly in the Lumbwa District.

DISEASES OF THE HORSE.

Epizootic & Ulcerative Lymphangitis.—Previous to the outbreak of war 18 cases of Epizootic and 26 cases of Ulcerative Lymphangitis came under our notice in the districts adjacent to the Railway.

When war broke out, however, horses and mules were commandeered throughout the country and underwent a severe Veterinary examination on their arrival at Nairobi with the result that ulcerative Lymphangitis was found to be existent among equines on the Uasin Gishu Plateau to a hitherto unsuspected extent.

Dipping has been proved to be an efficient preventive against this disease, and in its treatment extremely good results have been obtained with a vaccine prepared by the Laboratory.

It must be remembered that one attack of this disease only confers a temporary immunity and wherever possible healthy or recovered animals should be regularly dipped or sprayed at seven day intervals. Treatment of Epizootic Lymphangitis with Potassium Iodide is under trial at the Veterinary Laboratory and the results so far have been extremely hopeful.

Horse Sickness.—Fifty six cases were reported during the year and most of these occured in Nairobi. The mortality from this disease has not been a large one, very fortunately, for some years past, and, with the better stabling of animals which is now possible and the experience gained by horse masters throughout the country, we may hope that the death rate from this disease will never reach the high percentages recorded in South Africa.

DISEASES OF SHEEP.

Scabies of the Sheep.—This disease is ubiquitous, and, while the hairy native sheep suffers little, the causal parasite has disastrous effects on the wooled animal.

Many flockmasters are content with dipping their animals at fortnightly intervals and are surprised when the disease still manifests itself in their flocks. It is to be remembered that, in advanced cases of scabies, the epidermal crusts form a protective shield to the parasites burrowing underneath, and, unless these crusts are removed and the lesions hand dressed prior to dipping, the disease will go on indefinitely. It has recently been proved that in Sub-tropical climates such as East Africa the life history of the parasite is shortened, therefore, to obtain the best results from dipping, affected flocks should be submitted to regular immersion at least every ten days.

DISEASES OF THE GOAT.

Pleuro-Pneumonia. (Goats)—This disease, as stated in previous reports, is widespread in the native reserves. The etiology of this disease is still veiled in mystery.

DISEASES OF PIGS.

Swine Fever.—It is probable that this highly contagious disease is not carried by air or through the medium of external parasites such as fleas or lice, but, it has been proved capable of transmission by the ingestion of infected faceal matter or urine soiled foodstuffs.

Advantage has been taken of this fact by several farmers who have fenced in their pig runs with wire netting, thus eliminating the danger of infection from wild porcines.

There is no country in the world where pigs can be reared so cheaply and pig breeding is rapidly becoming one of the most lucrative industries of the Protectorate.

DISEASES OF DOGS.

Rabies.—No cases came under notice during the past year.

OSTRICHES.

As stated in the report of the Veterinary Department for 1913-1914, the castration of male and female ostriches has been undertaken. The operations were carried out on a farm at Ulu and the results obtained have been quite excellent in the male bird. The female birds operated on had, however, already reached the breeding stage and consequently were not in a favourable condition to withstand the operation.

POULTRY.

Kikuyu Fowl Disease, an extremely acute form of fowl cholera, has been the cause of a large mortality in different parts of the country.

THE PERMIT SYSTEM.

The permit system acts as a check on the movement of native cattle entering and leaving Native Reserves, and also acts as a safeguard on outbreaks of disease outside the Reserves. It has acted as a deterrent to stock thefts, and has assisted the Police in their endeavour to suppress this prevalent crime. There are at present 49 Honorary Permit Issurers and the Administrative Officers and Police Officials in the various districts also act as Permit Issuers.

I take this opportunity of thanking the Hon. Permit Issuers for their co-operation and kind assistance during the past year. Over 2,000 cattle permits, 1,594 sheep permits and 14 pig permits were issued from the Permit Office, Nairobi, during the year. These permits were for the movement of approximately 84,500 animals.

LIVE STOCK IMPORTATIONS.

The following animals, apart from those imported for military purposes, were passed through the ports of Mombasa and Kilindini during the last twelve months.

Horses.	100	Goats.	5,871
Mules.	444	Pigs.	19
Donkeys.	56	Poultry.	403
Cattle.	1,013	Dogs.	39
Camels.	221	Sheep.	3

MEAT INSPECTION.

The following are the Nairobi Slaughter House returns for the past year :—

	Slaughtered.	Condemned.
Bullocks.	2,281	137
Sheep & Goats.	35,332	344
Pigs.	160	
	37,773	481

For purposes of comparison the figures for 1911-12, 1912-13 and 1913-14 were as follows :—

Slaughtered.	Bullocks.	Sheep & Goats.	Pigs.
1911-12	765	26,756	...
1912-13	1,057	30,482	...
1913-14	1,567	35,957	102

The increase shown this year in the number of cattle slaughtered is due to the presence of additional troops in Nairobi.

Cattle carcases were condemned principally for measles and East Coast Fever while Pleuro-pneumonia, Nairobi Sheep Disease and emaciation accounted for the condemnation of sheep and goat carcases.

Owing to the prevalence of anthrax in the neighbourhood of Nairobi, the Veterinary Department took immediate steps to avoid an animal, affected with this disease, being slaughtered for human food. These steps consisted of quarantine, taking temperatures and Veterinary inspection prior to slaughter. It is very gratifying to know that the measures adopted were efficient, as no case of anthrax was discovered in the slaughter house.

TRADING.

Through the Veterinary Station, Rumuruti, the following stock were inspected, inoculated or dipped and passed :—

Cattle	6,193
Sheep and Goats	29,380
Horses	9
Mules	132
Donkeys	118

BRANDING OF STOCK.

During the year 70 brands were registered. The branding of stock was discussed at the Convention of Farmers' Associations and it was unanimously agreed, that the branding of European owned stock should be made compulsory, while cattle, the property of natives, should remain unbranded.

It was pointed out that, for the branding of native owned stock, a very large and elaborate organisation would be required and that the identification of cattle stolen from Europeans and taken into Native Reserves, would be rendered more difficult if native owned cattle were branded.

GENERAL.

On the outbreak of war in August, the entire staff of the Veterinary Department was requisitioned by the Military Authorities and organised on a war footing. It will be readily understood that the routine work of the Department has, to a certain extent, been disorganised in consequence but every endeavour has been made to cope with outbreaks of disease, and as much attention given to civil duties, as has been possible with the small staff available and the multifarious duties it has been called upon to perform.

The Department, at present known as the East Africa Veterinary Corps, is responsible for all work of a Veterinary nature in the field, the obtaining, purchase and control of all remounts, the procuring of transport oxen and the purchase of livestock for meat supplies for the troops. In addition, a portion of the staff has taken charge of the large mobs of cattle, numbering several thousand head, which were confiscated from the Kisii and South Kavirondo tribes.

Owing to its special knowledge, the Department had to select and commandeer the oxen necessary for military transport as the operations in the field were being conducted through East Coast Fever infected districts and it was, therefore, of the utmost importance that only animals resistant to that disease should be obtained.

As was anticipated the losses from Trypanosomiasis (tsetse fly disease) have been very heavy in fly infested areas, particularly has this been the case in the Voi and Karungu districts.

The mortality from horse sickness, due in large measure to the care exercised by the Veterinarians in the field in the selection of sites for horse camps, has been very small indeed.

In large field operations in which thousands of oxen are necessary for transport and hundreds of horses and mules are used and, where very fatal contagious, fly and tick borne diseases are rife, the difficulties to be surmounted can only be appreciated by those who have knowledge of the conditions obtaining in the

districts of the country where such operations are in progress. Aided, however, by the valuable work carried out at the Laboratory, the field staff have been able to cope with severe outbreaks of anthrax and rinderpest by vaccine and serum thereby involving over 50,000 inoculations.

This report is of necessity somewhat curtailed but I append the report of the Veterinary Pathologist which details the experimental and research work carried out during the year.

In conclusion, I would take this opportunity of recording my very heartiest appreciation of the work done by every member of my staff, both executive and clerical.

I cannot say more than that I am proud to be the head of an organisation which has so willingly devoted its best energies to carrying out its combined civil and military duties.

Animated by one desire each member has, at considerable self-sacrifice, always striven to play well his part in serving his King and his country at this time of the nation's need.

(Signed.) ROBERT J. STORDY,

Chief Veterinary Officer.

ANNUAL REPORT

OF THE

VETERINARY PATHOLOGIST

FOR THE

YEAR 1914-1915.

VETERINARY PATHOLOGICAL LABORATORY,

KABETE.

THE CHIEF VETERINARY OFFICER,

NAIROBI.

Sir,

I have the honour to submit herewith my sixth Annual Report as Veterinary Pathologist. The period covered being the financial year 1914-1915.

The normal routine work of the Laboratory was continued up to the outbreak of the present hostilities. Since that time a considerable number of additional duties have devolved upon us, but every effort has been made to continue the normal routine duties.

Research work has of necessity been in a large measure suspended excepting in such cases of disease as are securing unusual prominence owing to Military operations, and to those conditions which are directly effected by our routine, serum and vaccine preparations.

In this report it will not be possible to enter into such details as I would have desired, more particularly as for the past two years I have endeavoured to prepare a summary of the research which has been undertaken, and which I believe would have been available for publication this year had not the War so seriously interfered with the usual work. I propose to confine myself to a brief summary of the more important operations undertaken during the year together with a synopsis of the various diseases which have been under observation or experimentation.

PERSONNEL.

The Assistant Veterinary Pathologist, Mr. Kearney and myself have been on duty throughout the year.

Clerical Staff.—On the outbreak of war, Mr. A. Walker was requisitioned by your Office. Mr. W. S. Bromhead was appointed temporarily on December 24th to assist in the clerical work here during Mr. Walker's absence. Mr. L. Myers arrived from England as Stenographer and Typist on February 22nd. Between August and December all clerical duties devolved on Mr. Galway who has been on duty throughout the year.

Lay Laboratory Staff.—Messrs Schultz, Gray and Scott have been in residence throughout the year. Mr. Peter Cairns was transferred to the Sanitary Branch of the Medical Department on September 2nd having been relieved by Mr. J. Ford who arrived from England on August 22nd.

Storekeeper.—Mr. S. J. Watkins resigned this temporary appointment on March 31st, and was succeeded by Mr. J. Scott who took up his duties on the 1st May.

Mechanic.—Mr. J. Cairns was appointed to this post on April 1st, on the completion of the installation of the Gas, Steam and Electrical Plant.

Yard Foreman.—Owing to the large number of Military animals which were sent here for experimetal treatment, and suffering from various contagious diseases, Corporal Jenkins of the E. A. V. C. was transferred here on September 28th. His duties were taken over by Corporal Mitchell, E. A. V. C. on December 31st.

Laboratory Students.—Messrs Duirs and Hoddinott resigned on August 17th, 1914, and February 17th, 1915, respectively both to join the Protectorate Forces.

I must again express my gratitude to every member of the Staff for the hearty co-operation which they have manifested during the year, and for the loyalty which they have shewn in assisting to carry on the work of this Institution during the present crisis.

CORRESPONDENCE.

An increase of 3,259 inward and outward letters, and telegrams is to be recorded. The total dealt with being 12,421.

LABORATORY BUILDINGS AND EQUIPMENT.

Gas, Electrical and Steam installations were completed during the year, and have been found to be most satisfactory and economical additions to the Plant. Prior to their installation it was not possible to undertake much of the work necessary for research or experimental treatment, but we may now regard ourselves, even though still lacking in many desirable details, as being a Laboratory equipped for most eventualities.

With a view to solving many of our difficulties in regard to forage and foodstuffs, some 50 acres of land were put under cultivation, and a further 50 acres are now being broken up. These strips of cultivation have been so arranged as to constitute a barrier between the infected land of the Laboratory and the clean land on which our healthy susceptible stock at present live. As I pointed out in my last report, this does not entirely safeguard us against accidental introduction of disease but I believe that with due precaution it will in great measure prevent the frequent incursions which have occurred in the past few years.

LIVESTOCK.

SPECIES.	Remaining on books 31-3-14.	Received during year.	Total for year.	Remaining on books 31-3-1915.
Horses	15	87	102	43
Mules	9	168	177	53
Donkeys	8	51	59	22
Cattle	510	553	1,063	417
Sheep	213	411	624	267
Goats	5	98	103	26
Pigs	20	51	71	28
Total ...	780	1,419	2,199	856

THE TECHNICAL WORK.

1. ROUTINE.

(*a*) **Examinations.**—A total number of 3,772 slides and specimens received from Government Officials and Private Owners were examined and reported on during the year. The principal findings will be dealt with under the diseases concerned.

(*b*) **Serum and Vaccine Preparation.**—274,368 doses of Anti-Rinderpest Serum equivalent to nearly 5,500 litres were manufacturcd within the period under review. Of this total 230,384 doses were issued as under:—

Laboratory for experimental purposes ...	2,354
Government Officials	44,790
Private Individuals	4,850
For Military purposes within the Protectorate...	47,670
To other Countries	130,720

The Serum issued for Military purposes and to other Countries was prepared out of funds rendered available through the establishment of a Suspense Accouut for the purpose of manufacturing Anti Rinderpest serum in quantities in excess of what was likely to be required in this Protectorate, and for which our Maintenance Votes would be wholly inadequate.

Up to March 31st 1915, 332,293 doses of Serum were issued against the Suspense Account. By the establishment of this account not only have our Buildings and Laboratory equipment received an augmentation, which would otherwise have been impossible, but the Protectorate Revenues have been substantially benefited. My report to you of May 5th set out the position of this account to the end of the last financial year.

Table showing the amount of Serum and Vaccine prepared and issued during the year 1914-1915.

Anti-Rinderpest Serum.	Prepared	274,368	Issued	230,384
Anthrax Vaccine	„	32,180	„	28,980
Black Quarter Vaccine	„	9,400	„	5,290
Colon Bacillosis Vaccine	„	701	„	678
Ulcerative Lymphangitis Vaccine	„	2,923	„	1,948
Canine Trypanblau	„	269	„	200
		319,841		267,480

2. DISEASES UNDER OBSERVATION.

(a) Diseases affecting stock In general.

Anthrax.—This disease has assumed epizootic proportions commencing during the dry weather of September last. In cattle 102 positive diagnoses were made ; 52 cases were encountered in Equines ; and one in Pigs ; and 24 specimens were reported as being very suspicious of Anthrax. These figures by no means represent the number of cases which occurred in the Protectorate at that time. On most farms specimens were only submitted from the first few animals that died, while in a great number of instances there is no doubt that failure to arrive at a diagnosis was due to imperfectly prepared specimens. It was observed that in a great number of cases a diagnosis from microscopical examination of a blood smear was not possible, and it was only when an ear or a swab made from the blood of the dead animal was forwarded that the condition could be diagnosed by cultural methods. Large numbers of sterile swabs have been distributed throughout the country, but since the onset of the rainy season a marked dimunition of positive cases has followed.

In the case of the pig above referred to, the disease had assumed the chronic type, which in this animal manifested itself by a diptheria like deposit in the throat. Tests made with the cheese material from this region demonstrated *B. Anthracis.*

The disease was diagnosed from practically every district of the Protectorate, and the sudden exacerbation must I believe be put down to the close cropping of the pastures resulting from the dry weather, and in some instances from over stocking.

As soon as our gas installation was completed it was possible to undertake the preparation of an Anthrax vaccine, for the manufacture of which a constant temperature, which cannot be obtained from an oil lamp, is necessary.

The conditions obtaining in this Protectorate render the vaccination of stock by means of a double vaccine at 14 days interval a matter of considerable difficulty, and in spite of the slightly increased risk resulting from the use of a single vaccine, this latter form was decided upon, as by its employment a single inoculation only is necessitated. With one exception the results obtained by the use of this vaccine have been most favourable. Very few instances of failure to complete immunity to natural attack have been recorded, and I am of the opinion that the free use of this vaccine did much to check the Epizootic which threatened.

Owing to causes which are not yet definitely ascertained, and which although admitted as possible by other workers, do not seem to have attracted much attention from Serologists, one brew of vaccine was shewn to be extremely dangerous. This particular batch was subjected to the same tests as were found satisfactory for previous issues, and was used in practice upon a valuable stud of horses, and upon a number of Government owned oxen. The inoculation of these animals was carried out some 40 days after the initial test had shewn the preparation to be harmless. In the cattle a mortality of about 12% was recorded. In the cases of the horses 41% died, 27% manifested most serious and severe symptoms, but recovered as a result of inoculations with Anti-Anthrax Serum. Seven animals of the stud representing 32% manifested a normal reaction to the vaccination. One animal failed to shew any effects at the time of inoculation, but 50 days later large local swellings and severe symptoms supervened : recovery eventuated following injection of Anti-Anthrax Serum. The success attending the use of over 23,000 doses of Anthrax vaccine, prepared and tested in an identical manner to that of the brew in question, renders the position one of considerable difficulty and anxiety, and I am disinclined to issue more Anthrax vaccine until the factors which determined the virulence referred to, have been more clearly ascertained. In the course of the routine work for the diagnosis of this disease several microbes, possessing characteristics resembling those of the true Bacillus Anthracis, but lacking its pathogenic power, have been encountered. These formed the subject for research by Mr. Kearney.

2. Trypanosomiasis.—160 cases of this disease were diagnosed in slides submitted. Of these 105 were in cattle, 52 in Equines, and three in dogs. This represents a large increase over previous years, which is due to the greater movement of susceptible animals within the areas inhabited by the Tse-Tse

Fly. Up to the commencement of hostilities our work on this condition was confined to research as to the nature of the various species of Trypanosome met with in the Protectorate, their distribution, and the animals affected by each, but during the latter part of the period under review large numbers of Military animals have been made available for experimental treatment.

It is well to dispel the view popularly held that Trypanosomiasis or "Fly Disease" is a single morbid condition. The number of diseases grouped under this one name within this Protectorate is probably at least ten, the causal Agents of which are from a Zoological point of view quite distinct; and from a practical point of view they differ in so far that each affects different classes of animals. Recovery from one form does not imply immunity to any other form, and it will, I believe, be shewn that a treatment that is efficacious against one is not good against another. The symptoms produced by all forms are with rare exception very similar. The exceptions being a form which was mentioned in my report of 1911-1912, the symptoms of which were closely akin to those of horse sickness, and a form which has come under observation on several occasions since August where the animal although affected and frequently shewing Trypanosomes in his blood, maintains his condition, works with equal vigour, and practically manifests no outward symptoms whatsoever.

In the very great majority of cases which have come under our notice, the animals affected had at sometime been in association with the Tse-Tse Fly, but I would again draw attention to my remarks in the report of 1911-1912 wherein it was suggested that flies other than Tse-Tse might under certain circumstances be capable of transmitting the infection, and pointing out the great danger that exists should this form of disease once be established in the Highlands.

Treatment.—Experiments have been conducted with such drugs as "606," Galyl, Atoxyl, Soamin, Mercury, Tartar-emetic and Arsenic in various forms and in various combinations. No good results whatever have been obtained, such animals as appear to have recovered being still infective. Holmes' method of treatment for Indian Surra, which consists in the administration of very large doses of Arsenic, has been tried on a high proportion of the cases sent to the Laboratory. The results from this method of treatment in India where only one form of Trypanosomiasis exists is:—that due to *Trypanosoma evansi*, have been most satisfactory; over 80% of recoveries having been recorded. The system followed here has been identical, yet there is not one case which has recovered. It would appear therefore that the forms of Trypanosomiasis encountered here, and the largest number are due to infection by *Trypanosoma pecaudi*, are not in any way influenced by Holmes' method, and possibly each form will require its own treatment.

3. Helminthiasis.—Experimental work with the wireworm of sheep has been continued with a view to ascertaining for how long an infected animal, maintained under such conditions as preclude a reinfection, can retain the worm in its stomach; and secondly, for how long pastures may remain infected after sheep have been removed. The results of these observations are not yet fully available, but it would appear that land will remain infected for at least twelve months after the removal of all sheep, and also that sheep may retain worms in their stomachs for at least six months although fed with artificial foods, and otherwise safeguarded from the possibility of new worms gaining entrance to the stomach.

Considerable mortality has been experienced at the Laboratory during the year from a disease of cattle which outwardly presents very great resemblance to Trypanosomiasis. Affected animals appear unthrifty, they gradually lose condition, the coat becomes harsh, rough and hide bound. The membranes of the mouth and eyes are pale and anaemic: they always appear empty, and in spite of extra feeding continue to lose condition and die. On Postmortem examination of such, the fourth stomach is found to be inflamed, and the contents to contain a vast number of worms which appear to the naked eye identical to the wireworm of sheep. It is not yet determined whether the two worms are of the same species, and experiments are at the present time in progress to ascertain whether infection of cattle can be conveyed to sheep and *vice versa*.

Treatment of this condition has been attempted by means of Arsenic in various preparations, Bluestone alone or in combination, and Lysol. As in the case of sheep this latter drug has given the most uniform results, and though it is certainly not a specific, cattle undoubtedly improve under its influence. The dose now given as a routine precedure is 8 ozs. of a 5% solution. The amount is administered in the form of a drench on four successive mornings, the cattle being starved prior to dosing.

It is difficult to conceive that any drug will be found capable of destroying all stages of the worm within the stomach, and which will not at the same time damage the stomach wall, and it would appear that efforts of treatment must be directed towards destroying the young form of the wireworm before they can reach maturity, and continue the infection of the land through their eggs. Owing to the complicated system of stomachs in ruminants a large quantity of the medicament is lost before it can reach the fourth stomach, in which alone the wireworm lives. Experiments were therefore instituted to ascertain whether it would not be possible to inject the medicine directly into the fourth stomach by means of a needle which would puncture the abdominal wall and directly enter the stomach. The operation was found to be simple, and with practice would be one which

could be easily carried out by the Stock Owner. Lysol in a 5% solution and in an amount of 200 c. c. was tolerated, and although the number of animals available for comparison is not very large, it appeared that a greater destruction of the wireworm followed this method of administration than was possible when the drug was given by the mouth.

A worm invasion of the stomach of Equines due to the *Genus Spiroptera* has been very frequently encountered among Horses, Mules and Donkeys, which died at the Laboratory from other diseases. Efforts at treatment with Lysol in the same dose and in the same strength as when given to cattle by the mouth, have been attempted, and I am of the opinion that in most instances the rapidity of the disease has been checked and the serviceableness of the animals prolonged. The symptoms of this condition are a gradual wasting, a harsh staring coat, progressive weakness, and a very aneamic appearance of the membranes. A very large number of Donkeys coming from Suk and Turkana were found to be infected with this parasite. The diseased animals also suffered in many instances from Trypanosomiasis and possibly from a disease known as Infectious Anaemia; it is not possible to state which factor was the most important.

A serious mortality in young sheep was recorded from one farm, and from the material submitted and the particulars furnished by the owners, it would appear that the worm *Cesophagostomum Columbianum*, which is very prevalent throughout the Protectorate, and usually causes a comparatively chronic disease accompanied by the formation of nodules on the walls of the intestine, may under certain conditions induce an acute and rapidly fatal disease in young sheep, the symptoms of which were Bloody Diarrhœa, rapid emaciation and collapse.

DISEASES AFFECTING EQUINES.

Ulcerative Lymphangitis.—83 cases of this disease, which is due to infection by the Bacillus Preisz-Nocard, were diagnosed from slides and specimens submitted from the field during the year, and 60 infected animals belonging to the Military and over 40 privately owned horses or mules have been sent to the Laboratory for experimental treatment.

The figures quoted, although showing a considerable increase on previous years, by no means represent the total number of cases within the Protectorate. The organism of this disease is extremely wide spread, and it is doubtful whether any one district could be pointed out as being free of infection.

This causal microbe may produce symptoms which vary in intensity from an insignificant pustule to abscesses covering the whole of the body. Pus smears prepared from the lesions

suspected should invariably state whether the diseased area is of recent date or old standing, for in the latter case we expect to find microbes which under the microscope are indistinguishable from the *Bacillus Preisz Nocard.*

The variety of clinical forms manifested in this disease is considerable, but the type prevailing on the Uasin Gishu Plateau may be taken as fairly typical. Here the condition generally commences by the formation of one or a few abscesses around the fetlocks more particularly on the hind legs. From there it extends towards the thighs, and as each abscess bursts and discharges it leaves a thickening of tissue and a dry cicatrix to mark the place. In some instances the whole body may be covered with abscesses, and in this case, should a fatal result occur, it is usual to find internal abscesses sometimes of the dimensions of a child's head and most commonly situated near to one or both kidneys.

In some chronic cases localised abscesses continue to occur down the thickened limbs with occasional outbreaks on different portions of the body. In a large proportion of these chronic cases the skin acquires a peculiar scab like formation somewhat resembling a warty growth, which can be readily removed with the fingers leaving beneath a slightly raw skin which is usually elevated in a cone-like manner on to which the scab fits like a cap. Examination of these scabs shows a constant presence of a characteristic microbe known as a *Streptothrix*, the appearance of which is quite different from that of the Bacillus Preisz-Nocard, but from the close association between these two diseases it appears possible that the one form may report a stage in the development.

In my last report I referred to the difficulty in diagnosis, and to the fact that substances allied to Tuberculin and Mallein were being experimentally tested. These preparations gave no good results.

Experiments in treatment have been conducted on a much larger scale than heretofore owing to the number of animals which have been placed at our disposal for this purpose.

I have previously referred to the weekly injections of a vaccine made from the *Bacillus Prisz-Nocard* as yeilding much better results than anything which has been obtained with drugs. At the time of my last report, and for some months subsequently, a dose of 2,000 Millions of dead Bacteria was injected weekly. It has been clearly shewn that this dose is too high, and much more satisfactory results are being obtained by the initial injection of 100 Millions, the weekly injection being continued with slightly increased amounts until a maximum of 1,000 Millions is reached about the 10th week. With one or two injections all tendency

to new abscess formation ceases. Ths open sores dry and assume a more healthy appearance, and we have been able to discharge as cured a large proportion of animals which have been subunitted for treatment in the early stages of the disease.

In the chronic form, treatment is much more prolonged. Owing to the formation of new fibrous tissue around the seat of the abscess, and owing to the thickening of the limbs, vaccine circulating in the system has great difficulty in reaching the various diseased centres. It has been found that a combination of vaccine Therapy, and the application of a mild blister to the thickened limbs greatly assists reduction, but it is doubtful whether lasting benefit can be produced in such cases.

A large quantity of vaccine has been issued to the Uasin Gishu Plateau where a Stock Inspector has been stationed to note the effects produced in cases there which are being treated by their owners. The returns received have not been very satisfactory, and are not in proportion to the good results which have been obtained at the Laboratory under an identical system of treatment. Although a definite procedure was laid down, I cannot but think that many owners have injected more than the correct dose of vaccine in the hope of hastening recovery. With vaccine treatment exactly the opposite effect is produced, the administration of too large a dose or at too frequent intervals tends to paralize the recuperative powers of the body and to induce a stagnation in recovery which it is often very difficult to correct.

Indiscriminate issue of vaccine has now been stopped, but owners of infected animals may still receive vaccine on application at the Laboratory provided that regular reports are furnished which will enable me to check the progress recorded, and to advise modified treatment when necessary.

It is not yet known whether recovery due to vaccine treatment means that such an animal posesses a degree of immunity higher than that enjoyed by a healthy Equine, There are several instances of animals having broken down when apparently cured, and it would appear therefore that little or no immunity results, but as I have already stated this organism is so wide spread in nature that animals are continually exposed to a reinfection, and it may be that there exist certain strains of the microbe which are sufficiently strong to break down any mild immunity which may have resulted. On the other hand, the disease is frequently of such a chronic character that it would be difficult to state definitely that recovery had occured. Some small centres of infection may be lying dormant in the body and when once the effect of the vaccine has worn off these may come to life and restart the symptoms of the disease.

Regular dipping exercises a most beneficial effect upon those cases of this disease upon which the lesions are localised to the skin, but it is not to be expected that much benefit can accrue in such animals as are affected with abscesses beneath the skin or in the internal organs. It is in such cases that vaccine treatment alone can be expected to offer good results. The dipping of healthy stock will in my opinion do much to minimise the danger of infection as the action of the dip will tend to heal the small abrasions and tick wounds through which in all probability the causal microbe often gains entrance.

Epizootic Lymphangitis.—52 cases of infection with this disease have been chronicled, and smears submitted from the field.

31 Military animals have been available for experimental treatment, and over 20 privately owned horses and mules.

It is to be regretted that the term Lymphangitis is applied to this infection as well as to that last described, which is due to the Bacillus Preisz-Nocard. Not only is the causal organism, which in this case is the *Cryptococcus farcinomosus*, quite distinct, but the symptoms produced are totally different, and the treatment in each case is quite dissimilar. The Cryptococcus infection is usually a true Lymphangitis, infection spreading in a line along the Lymphatic vessels which become thickened, nodular, and eventually suppurate to discharge pus.

Early in the infection it would be difficult to diagnose these two forms by the naked eye, but when once a definite chain of buds and abscesses is seen an owner should have little doubt that the infection is one of Epizootic Lymphangitis.

Microscopical examination of pus smears readily distinguish between the two infections, the Cryptococcus being invariably present in large numbers when it is implicated. This microbe is extremely difficult to grow artificially, but it is worthy of record that one strain was obtained from which artificial culture was possible. This positive result dispels the views of the French writers that artificial culture was impossible. The practical importance of this result lies in the fact that in Madagascar, and also in other parts of the world, a disease presenting very similar symptoms to Epizootic Lymphangitis has been detected, the causal microbe of which presents considerable superficial resemblance to the Cryptococcus, but it is comparatively easy of artificial culture and by this means a differential diagnosis may be established. This condition which is known as Sporothricosis has not been detected in East Africa up to now.

The results of treatment by means of Salvarsan were good, but the expense of this drug makes it prohibitive except in exceptional cases.

Mercurial cream, which was referred to in my last report, failed to give the good results which were hoped for. A certain percentage of cases were benefited by this means, but animals so treated lost condition, which was never fully regained, even though most liberal dietary was allowed.

The administration of Potassium Iodide, either alone or in combination with the Biniodide of Mercury, has yielded results which leave little to be desired. Owing to the difficulty experienced in obtaining a sufficient amount of Potassium Iodide for the large number of animals under treatment, and also owing to the increased cost of this drug, a larger dose of Biniodide of Mercury has been tried, but I am not yet able to state definitely what amount of this drug can be tolerated for the period necessary to effect a cure.

It would appear essential that for success with this drug treatment, animals must receive a dose every day for approximately a month. The routine practice now employed here, when a sufficiency of the drugs employed is available, is the administration of half an ounce Potassium Iodide and five grains of Biniodide of Mercury each morning in the drinking water, the supply of water and green grass being curtailed until the full dose has been drunk. Even in advanced cases, a marked drying of all lesions is apparent from about the seventh dose. The thickening of the Lymphatic cords decreases, nodulation disappears, and in about a month an animal, unless in a very advanced state at the commencement, will fail to show any outward trace of the disorder.

As in the case of Ulcerative Lymphangitis early diagnosis and immediate application of treatment is most desirable.

The disease appears to be wide-spread through the Protectorate, although no cases have to my knowledge occurred on the Uasin Gishu Plateau, where the Ulcerative form is so rife.

GENERAL.

Equine Diseases.—Heavy mortality was experienced in the various Remount Depots of the Protectorate among Donkeys, more particularly those recently received from Suk and Turkana.

In my report for 1911-12, I referred to a condition known as *Infectious Anaemia*, and suggested that this disease occurred in some localised parts of the Protectorate. Experiments were therefore instituted to ascertain whether this was responsible for the extreme debility and anaemia manifested in the donkeys above mentioned.

Inoculation of apparently healthy animals have in some instances brought about indications of infection, but as the animals experimented with were of local origin it is possible that a certain amount of immunity or resistance might exist, and I am

therefore hopeful that it may be possible to obtain some horses from India where this disease is not yet described, and that further experiments may definitely decide whether or no Infectious Anaemia was responsible for the heavy mortality.

The naturally infected donkeys in some instances also showed the presence of Trypanosomiasis, and in nearly every case there was a very heavy invasion with worms. It is therefore possible that these two latter causes may alone be responsible.

Infectious Anaemia has come into some prominence within the past year, as it is owing to its introduction as a concurrent disease with the virus of Horse Sickness that Sir Arnold Theiler has been compelled to temporarily suspend the immunising of Equines against Horse Sickness. The viruses of both these diseases will live for a very long time in blood after it has been drawn from the sick animal, and as both belong to the category of ultra visible microbes it is as yet impossible to separate them by Laboratory methods.

Horse Sickness.—We have been unable to carry out any further experiments with this disease during the year, but with the arrival of animals from India it is to be hoped that some definite data can be obtained as to the prevalence of this disease in the Protectorate.

One Military Unit sustained heavy losses from a disease the symptoms of which closely approximated to Horse sickness. There were, however, certain differences, which read in conjunction with our previous experiments into the diseases of this country which resemble this condition, leads me to believe that in all probability it will be found that true Horse sickness was not entirely responsible for the losses sustained. That true Horse sickness does exist in East Africa is clear, but the results which have been obtained by Sir Arnold Theiler with specimens of blood forwarded to him for experiment demonstrated that only a percentage of the suspected cases are affected with it.

DISEASES OF CATTLE.

Rinderpest.—No experimental work into this disease has been possible during the year. The manufacture of serum has been continued uninterruptedly the statistics regarding which, appear under the heading of "Routine."

Military exigencies demanded the active immunisation of the Transport oxen, and have in great measure prevented the carrying on of the plan formulated for the double inoculation of all cattle in the Protectorate. Wherever possible, however, active immunity has been conferred upon all Herds which have been subjected to natural outbreaks of the disease, and the figures received show most favourable results. It is doubtful whether a mortality exceeding 2% has been experienced in any one centre of inoculation.

It has become an invariable rule that in cases where double inoculation is to be entertained the virulent blood for this purpose must be obtained from the Laboratory, and either used within 48 hours of despatch, or a susceptible animal shall be inoculated with Laboratory virus and its blood employed for the immunisations *in loco*.

East Coast Fever.—393 slides of this disease have been diagnosed during the year. A great majority of these were received from the Kamiti Testing Area which is being maintained for the purpose of testing the immunity of cattle subjected with a view to allowing a freer movement of such cattle as are proved to be immune. With the establishment of dipping this disease no longer calls for much further experimental investigation, for there is no doubt that if an owner dips regularly in a dipping fluid of standard strength his losses, even during the first year, will be very considerably reduced, and after that period it is probable that all infected ticks will have been eradicated.

The Dipping tank at this Laboratory was not completed until July, but I am including the statistics over a period of the past 12 months.

The total cost of the dip, with a drying race 60 feet long, roof and yards was a few rupees less than £150, and no trouble has been experienced from cracks or leakages.

During the twelve months' use, 41,712 Cattle, 2,608 Equines and 5,914 sheep and goats were passed through.

The total amount of dipping fluid used, including that necessary to fill the tank in the first instance, was 27,586 gallons.

Throughout the year Watkins Pitchford's Laboratory formula was employed for the reasons that (I) the expense of material is considerably less than in the case with proprietary dips, (II) Experience in this Protectorate has shown that it is less liable to chemical alteration and (III) Stockowners who have experience of both the Laboratory fluid and a well known proprietary dip regard the former as the more efficient tick destroyer. It must, however, be admitted that there is greater risk of poisoning to stock from its use unless precautions are taken by a European to himself measure and weigh the required constituents.

Each hundred gallons of Watkins Pitchford's Laboratory formula for three day dipping contains.

Arsenite of Soda (80% Arsenic) ...	...	1 Pound.
Soft Soap	...	¾ „
Paraffin	...	2 „

The average prices paid for these articles in Nairobi were: Arsenite of Soda and Soft Soap, each Rs. 30 per hundredweight. Kerosine Oil Rs. 8-50 per case of eight gallons.

The total disbursments under these headings were :—

276 lbs. Arsenite of Soda @ Rs. 30/- per cwt.	say Rs.	75-00
208 lbs. Soft Soap „ „ „ „ „ „	„	56-25
68 Gallons Kerosene Oil @ 8/50 per 8 gallons	„	72-25
Total ...		203-50

As 44,320 large stock were passed through the dip at three day intervals throughout the year (say 122 dippings), the average was roughly 364 on each occasion. This figure gives a cost of material at 55·9 cents per animal per annum. In reality this figure should be reduced, for I have not considered the 6,000 sheep, most of which, however, were native, and short hairy coated.

Redwater and Anaplasmosis.—Although dipping will most certainly eradicate both these tick-borne diseases from a farm, circumstances have frequently rendered it necessary to expose imported and other highly susceptible stock to areas which it has not yet been possible to clean, and our experiments have been continued in the hope of obtaining strains of these diseases sufficiently mild to induce a modified infection which would render the animals immune to the stronger viruses of natural infection.

Some 30 imported English cattle, and 4 from South Africa have passed through our hands. Our thanks are due to Sir Arnold Theiler for having forwarded us the strain of *Anaplasma* with which a large number of his immunising experiments have been conducted, but unfortunately it was found that on arrival here it was too strong to be tolerated with safety by the cattle with which we were concerned. Our own attempts to obtain and maintain a pure strain of *Anaplasma* were given up as it appeared that each successive generation through a new susceptible animal increased the virulence so markedly that although the resulting disease was comparatively mild at the inception, after two or more passages it became so exalted that all animals inoculated succumbed. In our own experimental animals we obtained by far the best results by inoculating them with the blood of Uganda cattle.

It was shown that cattle coming from Uganda, primarily for Rinderpest-serum manufacture, contained in their blood the parasites of both Redwater and Anaplasmosis, and that this blood inoculated into susceptible animals in a dose of 2. c. c. induced a mild infection of Redwater between the 8th and 12th day and Anaplasmosis between the 20th and 50th. The former reaction, if severe, was easily checked by means of Trypanblau.

It was noticed that in the case of cattle from South Africa the reactions occurred between the 20th and 30th day. In the case of stock from England the earliest reaction began on the 36th day, and the latest on the 53rd.

Of 15 Shorthorns imported from England and immunised against Rinderpest, Redwater and Anaplasmosis, by the single injection of Uganda blood in which the Rinderpest virus was present, two died from Anaplasmosis, the reactions to Redwater and Rinderpest being normal.

Of four South African cattle immunised in the same way, one died from Anaplasmosis.

The mortality in these animals was thus rather over 15%, a proportion which would be too high for wide practical application, but is certainly very much less than would have occurred if these cattle had been exposed to naturally infected pastures.

It is interesting to note that in cattle which had been immunised to Redwater in England prior to despatch, the proportion of reactors to Anaplasmosis was much less than in the case of animals which had not been so immunised.

Young cattle appear to withstand immunisation by the method here described better than large stock, and in order to control our experiments which had in great measure been made on yearling Ayrshires, two Shorthorn, two Ayrshire, and two Hereford Bulls of between four and five years of age were purchased in Europe and sent to East Africa without receiving any injection at home. Two of these after being immunised here with the strain of Redwater, used for the purpose in England, received a local Anaplasma strain of the second generation ; both contracted a very serious attack of Anaplasmosis, one on the 53rd, the other on the 47th day, and died. Four others received wild Uganda blood. Mild and normal reactions followed in three, the fourth contracted an acute attack of Anaplasmosis from which it died on the 43rd day.

Treatment of Anaplasmosis has been attempted by means of intra-muscular injections with mercurial cream. It is believed that in some instances beneficial results followed this injection, but as the deaths of some treated cases show, it cannot be regarded as a specific.

Colon Bacillosis.—Experiments into the prevention of this disease in calves has been continued unintermittently, but considerable difficulty has been experienced in maintaining infection in the experimental house. It has, however, been clearly shewn that calves born in the presence of the incriminating organism under experimental conditions, contracted a disease which is indistinguishable clinically from White Scour.

A vaccine made with this incriminated microbe has been issued to a number of Stockowners for test in the field : 678 doses were employed, the method being to inject the contents of one tube *i. e.* ;—5. c. c. which contain 2,000 million of dead Bacteria, subcutaneously as soon after birth as possible. It is not yet possible to affirm that this substance has given as good results

in the field as it appeared to do under experimental conditions, but it is worthy of record that in no single instance have owners ceased the demand for the preparation, and the reports received from Dairy Farmers, with whom the loss from White Scour was formerly very considerable, indicate most conclusively that pronounced and strikingly beneficial results have followed since vaccine was introduced. As the disease is frequently of a seasonal character, further time must be allowed before final conclusions can be drawn.

It should be noted that the vaccine now being prepared contains only one strain of a single organism. As "White Scour" is in all probability frequently associated with the presence of more than one microbe, it is to be anticipated that in some cases failure to confer resistance will be recorded, and much further work is necessary to obtain various strains of the Bacillus Coli which is blamed, and the symbiotic organisms.

Black Quarter.—This disease has come more into prominence during the past year, sporadic cases having occurred on a considerable number of farms previously clean, whilst serious epidemics have been recorded from other farms for the first time.

Over 5,000 doses of a single vaccine have been issued within the year, and in most cases it may be claimed that vaccination was responsible for checking the mortality.

In one instance complaint was lodged that the vaccine itself was too potent, and that as a result of injection a considerable number of calves contracted the disease within a day or two and succumbed.

The Laboratory tests prior to issue were extremely stringent, and forcibly indicated that not only was the vaccine harmless when properly administered but that it conferred a strong immunity.

In one of the most serious outbreaks over 2,000 doses of the same batch of vaccine were employed upon all classes of stock, and not a single accident following vaccination was recorded.

I, consequently, cannot admit that this vaccine was the cause of the mortality recorded, and I believe that the association of the mortality closely following upon vaccination was fortuitous, infection from Black Quarter having already gained entrance to the calves which succumbed.

It cannot be too strongly impressed upon interested owners that to safeguard their cattle against Black Quarter, inoculation should be carried out at a time when no cases of the disease occur on the farm, and it should not be left until the infection has cropped up throughout the herds.

It is worthy of comment that in Black Quarter, as in so many other diseases which occur in this Protectorate, the Pathology differs from that of the same disease in other parts of the world.

In Europe it is firmly held that calves are immune whilst on milk diet, and that adult cattle are no longer susceptible to infection. There have been numerous cases of deaths from Black Quarter in calves of one to four months old, and in Bullocks and Cows of over seven years of age.

Contagious Abortion. We have no evidence that this disease has become more wide-spread during the year, but the fact remains that it does occur on several farms within the Protectorate, though I believe the losses which can be ascribed to it have been less than in former years.

Serological tests have been made with specimens of blood received from several farms, the comparison of reaction being made against five naturally infected cows living a tthe Laboratory.

In the case of one outbreak on a farm near Nairobi it was possible to undertake the test on all female stock numbering 245. 16 gave a definite reaction, and 14 a doubtful one. Owing to a considerable number of these animals being of a comparatively recent purchase, and having been obtained from several different centres, it was not possible to obtain a definite history with each. It was, however, noted that a few animals, in which the test was distinctly positive, were running with a normal calf at foot.

As in most cases one abortion confers an immunity in subsequent pregnancies, this is not to be wondered at for it is possible that the results of the abortion are detectable in the blood on testing for some years.

One of the cows maintained at the Laboratory for the past 18 months still gives a clear reaction on testing. She, however, calved a normal full term calf about 9 months ago.

Experiments are being conducted in the hopes of preparing a vaccine similar to that recommended by the Epizootic Abortion Committee in England, and as soon as the preliminary tests are shewn to be satisfactory, the method will be put into practice experimentally on one or two of the most heavily infected farms.

Disease "C. H."—In the course of an epizootic, the symptoms of which closely resemble a very mild form of Rinderpest, and which occurred near Kijabe, the owner forwarded a specimen of blood to enable us to ascertain whether the disease existing there was Rinderpest or not. It was shewn that the virus in question was not Rinderpest, that cattle immune to Rinderpest contracted the disease on inoculation, and that susceptible animals which had recovered from this disease might still be infected with Rinderpest.

The symptoms manifested were dulness, slight depression, and a high temperature lasting for 3/4 days accompanied by a dark foetid diarrhoea which later changed to constipation. There is some discharge from the eyes and occasionally the membranes of the mouth are somewhat inflamed.

An animal born on the farm, from which this specimen was received, but which had been at the Laboratory nearly two years, was found to be susceptible as were cattle coming from Ngong, Kamiti, the Rift Valley, Uganda and Zanzibar.

The inoculation of calves produced a more severe reaction than in adults. In Indian Buffaloes the reaction produced was more severe than in calves, and the affected animals show such extreme depression that death appeared imminent, though all recovered.

Although not manifesting symptoms, it was proved that Mules could harbour the virus in their blood from about the 6th to the 10th day after inoculation. Five animals out of 43 inoculated died.

It is probable that in some cases the inoculation of this disease only hastens death from other causes, but in one or two cases it appeared evident that "C. H." disease alone was responsible. The great majority of experimental animals manifested few outward symptoms.

One attack of the disease confers an immunity which lasts at least three months, reinoculation, even with large amounts within this period, fails to induce any reaction.

The virus appears to live in the blood corpuscles: serum is not virulent, and the organism does not appear to either pass through a Chamberland or a Berkfeldt Filter candle.

Defibrinated blood loses its virulence in about a week. Urine or faeces do not appear to be virulent.

Infection was not reproduced in an Eland from the Rift Valley, on Horses, Donkeys, Dogs or small animals.

Attempts to reproduce the disease by contact failed, and it would appear probable that subsequent investigations will show that this disease is transmitted under natural conditions by ticks.

An Anti-serum was made by fortifying among cattle with large doses of virulent blood, and in the tests that were made this Anti-serum unquestionably modified the intensity and duration of the febrile attack.

Arrangements were made with the owner of the cattle from which the original specimens of blood were drawn, and with his neighbour whose cattle was suffering from a similar disease at the same time, to forward to the Laboratory a number of cattle which could be tested for their immunity against this condition, as it would appear possible that the disease on the farms might have been Rinderpest, and that the obtaining of this new disease was accidental. Unfortunately, we were unable to keep this new disease alive nor have we yet been able to regain it from any other centre,

DISEASES OF SHEEP AND GOATS.

Nairobi Sheep Disease.—This condition has been responsible for considerable trouble at some of the Military Supply Camps. It has been possible within the year, both by field experiment and in the Laboratory, to prove that ticks of the species *Rhipecephalus Appendiculatus* can transmit infection, as adults when fed as nymphae on a sick animal. Other stages of this tick and other species of ticks are under experimentation now.

Pleuro Pneumonia in Goats.—Very serious epizootic of Pleuro Pneumonia occurred throughout the Protectorate about September last. We have, up to now, been unable to ascertain the causal organism, and we have not yet succeeded in experimentally infecting healthy animals.

DISEASES OF PIGS.

Swine Fever.—No outbreak of East African form of Swine Fever has been brought to my notice during the year, but it is believed that one outbreak did occur in which the owner lost every pig on his premises.

Experiments have been continued in the hopes of obtaining a method or a substance by which one or two animals could be induced to recover and from which it would be possible to obtain an immune serum, by the aid of which others could in their turn be immunised. In this we have failed entirely, and from a pig owner's point of view the position has not advanced one whit.

It is of interest to record that the Uganda Bush Pig has been shewn to be immune to the East African Swine Fever.

Our thanks are due to the Provincial Commissioner Jinja, to his Adminstrative Officers, and to Mr. Hutchins the Chief Veterinary Officer, Uganda, for their great assistance in this question, which arose from the desire on their part to obtain Swine-fever virus with which they could commence an Epizootic amongst the wild pigs of that Province, as the devastation caused by these animals in the native shambers was very considerable.

As the disease is not inoculable to these wild pigs resource must be had to bait poisoning by arsenic and powdered glass.

We are still most anxious to obtain living specimens of both Wart Hog and the Bush Pig in this Protectorate, and I sincerely hope that every Farmer, who is in the position, will do his utmost to obtain these animals for us.

Experiments made with the serum of the Uganda Bush Pig, which had been fortified with East African virus, have not yet given satisfactory results.

DISEASES OF POULTRY.

Kikuyu Fowl Disease.—109 cases of this disease were diagnosed in the Laboratory. Although the organism of Kikuyu Fowl Disease differs from that of Fowl Cholera it presents the same feature that virulence becomes lost with age. The preparation of a preventive vaccine has therefore been possible, and though not yet applied extensively in the field, experiments here have been most favourable, and I trust that during the coming year it will be possible to evolve a system by which this vaccine, which is itself a variable factor can be standardised and issued with safety to Poultry keepers.

It has been shown that Guinea Fowls are susceptible to the condition, but no cases have yet occurred in Turkeys or Ducks, though in many outbreaks these latter have been in close proximity to the sick fowls throughout.

I have the honour to be,

Sir,

Your obedient servant,

(Signed) R. EUSTACE MONTGOMERY,

Veterinary Pathologist.